

ANALYSES OF THE CZECH REPUBLIC'S CURRENT
ECONOMIC ALIGNMENT WITH THE EURO AREA

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A INTRODUCTION

If the Czech economy is to reap the benefits associated with introducing the euro it will need to be able to operate without an independent monetary policy and without the option of exchange rate adjustment vis-à-vis its most important trading partners. This ability will be affected by the similarity of economic developments in the Czech economy with those in the euro area, since the degree of alignment will co-determine the appropriateness of the settings of the monetary conditions in the euro area to the current situation in the Czech Republic. The ability to adjust rapidly to economic shocks will be an important factor, too. The Czech economy's alignment and its preparedness to adopt the euro can thus be assessed in terms of the long-term economic trends, the medium-term development of economic activity and the structural similarity of the Czech economy to the euro area economy, all of which affect the probability of asymmetric developments and the occurrence of asymmetric shocks, and the ability of the economy to absorb shocks and adjust flexibly to them. The analyses presented in this document therefore examine the Czech Republic's degree of economic alignment with the euro area and the Czech economy's ability to use alternative possibilities of adjustment.

This set of analyses of the Czech economy's alignment with the euro area in 2009 has been drawn up in line with the Czech Republic's Updated Euro-area Accession Strategy and assesses the current state of economic alignment and flexibility in individual areas. The exception is the development in fiscal variables, where the future outlook is also assessed even though it is predetermined to some extent by the current situation. This set of analyses is a follow-up to the documents of the same name published by the CNB in previous years. Compared to last year, new analyses have been added and the scope of some of the analyses has been expanded slightly. The box "Euro adoption in Slovakia" analyses the preparedness and experience of the Slovak economy with euro adoption. Most studies have been updated on the basis of the statistical data and information available in June 2009. Some studies, chiefly in the fiscal policy area, were updated in November 2009. The analyses are divided into two basic groups according to the type of question they try to answer. The section entitled "Cyclical and Structural Alignment" indicates the size of the risk of different economic developments in the Czech Republic compared to the euro area and hence the risk of the single monetary policy being highly suboptimal for the Czech economy. The section entitled "Adjustment Mechanisms" answers the question of to what extent the Czech economy is capable of absorbing the impacts of possible asymmetric shocks using its own internal adjustment mechanisms.

These analyses are aimed at assessing the evolution of the alignment indicators over time and in comparison with selected countries. The countries under comparison either are euro area members already (Austria, Germany, Portugal, Slovakia and Slovenia) or aspire to such membership in the future (Hungary and Poland).¹ All of the analyses attempted to make comparisons with all the selected countries. However, in some cases this was not possible owing to a lack of relevant statistical data. The values of the indicators for the euro area are

¹ The selection of euro area countries included in the comparison comprises countries that are comparable in terms of economic level and countries with which the Czech economy has trading links. The above selection is not associated with any assessment of how successfully these economies have performed in the euro area. Germany, the largest trading partner of the Czech Republic, at the same time provides a useful benchmark as a core country of the euro area, although when making comparisons with aggregate or average economic indicators for the euro area, the large weight of Germany in the calculation of those indicators must be taken into account.

defined at the EA-16 level.² The conclusion as to whether the degree of economic alignment in the individual indicators is sufficient for adopting the single currency cannot be made in absolute terms, but can ensue from the aforementioned comparison with other countries and the assessment of the evolution of the alignment indicators over time in the context of overall economic developments. In general, it can be expected that the benefits of adopting the euro will grow with greater economic alignment and more flexible adjustment mechanisms.

² The EA-16 comprises the euro area member states as of 1 January 2009, i.e. Belgium, Finland, France, Ireland, Italy, Cyprus, Luxembourg, Malta, Germany, the Netherlands, Portugal, Austria, Greece, Slovakia, Slovenia and Spain. Only in exceptional cases, owing to data unavailability, do the data not cover all EA-16 countries.

B EXECUTIVE SUMMARY

The Czech Republic's entry into the euro area will yield benefits for the Czech national economy, but will also generate risks linked primarily with the loss of two effective channels of adjustment, namely independent monetary policy and exchange rate flexibility vis-à-vis our major trading partners. The consequences of this change will be affected by the degree of similarity of overall economic development in the Czech Republic with that in the euro area and the Czech economy's flexibility and resilience to shocks. The analyses presented in this document assess the similarity of the long-term economic trends, the medium-term development of economic activity and economic structure, the adjustment capacity of fiscal policy and the labour and product markets, and the functionality of financial markets.

In previous years, thanks to high economic growth, the Czech economy was gradually catching up with the average economic level of the euro area and was also showing some signs of increasing alignment. However, developments in the past year were strongly affected by the global financial and economic crisis, which led to a sharp economic downturn. As a result of the crisis, the public finance outlook is deteriorating sharply. The interest rate differential and exchange rate volatility have increased and financial market integration has loosened. In 2009, the convergence trend of the domestic price level towards the euro area is likely to be interrupted temporarily and long-term unemployment will probably rise. One positive aspect as regards the flexibility of the Czech economy is a gradual partial improvement in the business environment. Conversely, problems persist in the institutional set-up on the labour market. The economic preparedness for euro adoption in the Czech Republic has worsened markedly from the previous year as a result of the economic crisis.

In the longer term, i.e. since 2003, when the Czech Republic's Euro-area Accession Strategy was adopted, there have been both favourable and unfavourable developments in terms of euro adoption and the flexibility of the Czech economy. Compared to 2003, real and nominal convergence has advanced. Public finance performance improved in 2004–2008, but the fiscal situation will worsen sharply again in 2009 and 2010 owing to the economic slowdown. In addition to cyclical factors, the fiscal deterioration will be due to expected growth in the structural public finance deficit. The correlation of economic activity with the euro area has increased recently, owing mainly to the global financial and economic crisis. Given the global and exceptional character of this shock, the observed increase in correlation does not necessarily signal a long-term change in the Czech economy's alignment with the euro area. Since 2003, there has been no major structural improvement in the labour market either. Except for some positive changes in the business environment, the flexibility of the Czech economy has not increased.

In terms of its current preparedness to adopt the euro, the characteristics of the Czech economy can be divided into four groups.

The first group consists of **economic indicators that speak in favour of the Czech Republic adopting the euro**, which traditionally include the high degree of openness of the Czech economy, its close trade and ownership links with the euro area, and the achievement of long-term convergence of the inflation rate and nominal interest rates, even though the level and volatility of interest rate differentials vis-à-vis the euro area have increased recently.

The second group comprises **areas which, in terms of euro adoption in the Czech Republic, continue to pose a risk of macroeconomic costs, but which have shown signs of improvement in recent years**. The positive developments include fast real economic convergence in the Czech Republic, including further convergence of the price level towards that in the euro area, even though a difference in the price level and in the level of economic

development persists and the distance from the euro area price level will increase again in 2009 (probably only temporarily). The correlation of economic activity between the Czech Republic and the euro area has recently increased, although this reflects the recent extreme global developments and is not likely to increase the probability of greater alignment of the business cycle going forward in normal global economic conditions. In terms of labour market flexibility, the positive developments also include an ability to make use of inflows of foreign labour at times of economic growth and, conversely, to reduce the number of foreign workers during the current economic downturn. Other favourable developments include a halt in growth in overall labour taxation and a rise in the ratio of the minimum wage to the average wage. Nominal wages in the Czech economy have been showing signs of flexibility in the past two years, but in real terms there has been no increase in wage flexibility so far. The business environment is also showing some gradual improvement.

The third group consists of **areas which have recently recorded adverse developments in terms of future euro adoption**. The public finance outlook has deteriorated sharply as a result of the economic slump and the budgetary measures adopted. The overall fiscal deficit will probably exceed 6% in 2009. The structural deficit will increase substantially, partly because of the anti-crisis fiscal measures. Despite measures subsequently adopted to stabilise public budgets, the rapid growth in debt servicing costs that started recently and, unfortunately, the traditionally ignored long-term ageing-related challenges pose a risk to the evolution and sustainability of public finance. A temporarily adverse factor in terms of future euro adoption and prior participation in ERM II is the persisting uncertainty on the financial markets, which – despite a gradual calming of the situation in 2009 – is manifesting itself in continued increased market volatility. In this context, the alignment of the exchange rate of the koruna with the euro and the alignment with the euro area of yields on individual financial market assets have decreased. The economic downturn will also lead to a rise in long-term unemployment next year. The existing structural problems on the labour market were exacerbated by a change in the social benefits area in 2007 which was not fully corrected by the subsequent reform.

The fourth group contains other **areas which are showing problems in terms of the economy's flexibility and ability to adjust to shocks and which, moreover, are not showing any significant improvements**. A persisting problem here is the low or unsuitable skills of the long-term unemployed. The costs of terminating open-ended employment contracts, particularly after a short period of employment, remain very high by international comparison and are contributing to employment inflexibility.

The following text in this section summarises developments in the individual areas analysed. The detailed results are given in part D, and a comparison with the previous year's results is given in section 3 of part D.

Cyclical and Structural Alignment

The costs arising from the loss of the Czech Republic's own monetary policy will be particularly pronounced if the Czech economy is not aligned with the euro area economy. The risks arising from the Czech Republic's accession to the euro area will decrease as the degree of alignment increases.

The degree of real economic convergence is an important indicator of the Czech economy's similarity to the euro area. A higher level of such convergence fosters greater similarity of long-run equilibrium development. Indirectly it can also foster a lower likelihood of misalignment in the shorter run. A higher degree of convergence in the economic level prior to ERM II entry and euro adoption should further increase the relative price level, which will decrease potential future pressures for growth of the price level and equilibrium appreciation

of the real exchange rate. The process of convergence of the economic and price levels has accelerated over the past six years. In 2008, GDP per capita in the Czech Republic was almost 75% of the euro area average, which represents a slightly higher standard of living than in the least advanced euro area countries. The price level in the Czech Republic increased considerably during 2008 owing to the sharp appreciation of the koruna, but was still below that corresponding to the observed performance of the economy. However, at 68% of the average price level of the euro area, the deviation was smaller than in the past. In 2009, though, due to a weaker exchange rate compared to the previous year, the distance from the euro area price level can be expected to increase again (probably only temporarily). The real exchange rate of the koruna (on an HICP basis) appreciated on average by 4.2% a year between 1998 and 2008, which is a significantly higher pace than in the euro area countries under comparison except Slovakia. Going forward, the equilibrium trend of real appreciation of the koruna against the euro can be expected to continue in line with the real convergence, according to the analyses at a rate of 1.3–3.5% a year. Persistence of this trend following euro area entry will initially engender a corresponding higher rate of inflation in the Czech Republic than that in the euro area and related lower domestic real interest rates (possibly even negative in the case of short-term money market rates). If this situation persists in the long term, there could be a risk of an overheating of the economy associated with adverse consequences for macroeconomic and financial stability.

Alignment of economic activity and similarity of economic shocks will help the single monetary policy to have an effective and appropriate effect on the economy in the monetary union. The analyses indicate increased correlation of overall economic activity between the Czech Republic and the euro area recently; the same goes for activity in industry and export activity. According to the analyses, the Czech Republic's export activity has recently been statistically significantly correlated with euro area exports. Compared to last year's analyses, the correlation of Czech exports to the euro area with euro area GDP has increased as well. Similar developments were identified for most of the countries under review. However, the significant recent rise in the monitored correlations, including the supply shock correlation, should be taken very cautiously, since these indicators have recently been strongly affected by the global economic downturn, which has affected both the Czech economy and the euro area economy. The resulting observed increased correlation is therefore not necessarily a good indicator of future developments.

Increased **drawing on resources from EU structural funds** could be a specific asymmetric factor that might impact on the Czech economy. This could act as a considerable economic stimulus, materialising primarily in increased investment activity. The actual drawdown of funds from EU structural funds and their economic use in the Czech Republic was slow until the end of 2008. However, data on the use of the structural funds for 2009 H1 indicate that the original difficulties with drawings have probably been overcome, so accelerated drawdown of funds for structural operations can be expected in the coming years (from the 2007–2013 allocation). This should be reflected in a rise in the inflow of EU funds. However, the economic stimulus from these flows will depend on the actual use of these funds by final beneficiaries. According to current estimates, only a slight positive economic stimulus from the inflow of EU funds is to be expected. The estimated amounts do not indicate any risk of a strong asymmetric shock.

Similarity of the **structure of economic activity** with the euro area should decrease the risk of occurrence of asymmetric economic shocks. In terms of production structure, the Czech economy retains a specific feature in the form of a higher share of industry and a smaller share of certain services in GDP compared to the euro area. Of the other countries under review, Slovakia has a comparable economic structure. The above-average share of the car

industry in the total output and value added of the Czech economy compared to the euro area is (as in Germany) a possible source of sector-specific shocks. This has been confirmed by recent developments.

Fast convergence of **nominal interest rates** in the immediate run-up to joining the euro area has acted as an asymmetric shock in some economies in the past. For a country planning to enter the monetary union, earlier gradual convergence is therefore an advantage. The difference between Czech and euro area interest rates was zero or negative for a long time (i.e. between 2002 and 2007). However, a modest positive interest rate differential opened up in mid-2008 and widened further during 2009 owing to the escalation of the global financial crisis, the significant fall in the ECB's key rates and the use of unconventional monetary policy instruments by the ECB. The interest rate differentials for three-month and five-year rates and the rates on ten-year government bonds increased, but remain lower than in Hungary and Poland. The heightened uncertainty and volatility of interest rate differentials also persist.

Another indicator of the possibility of sharing a single currency is long-term co-movement in the **exchange rates** of two currencies against a reference currency. Compared to the other currencies under review, the correlation between the rates of the Czech koruna and the euro against the dollar was relatively high until mid-2008, at about 0.8–0.9. The koruna's rapid appreciation in 2001–2002 and the short period following the outbreak of the financial crisis were the only major exceptions in this respect since 2000. Similar figures were recorded only by Slovakia, whereas Hungary, Poland and Slovenia (before ERM II entry) showed lower correlations. The fall of Lehman Brothers was followed by a deep fall (of several tens of per cent) in the correlations of the currencies of all the non-euro area countries under comparison. The decrease in the alignment of these currencies vis-à-vis the euro was affected by the surge in volatility in global financial markets and did not always reflect fundamentals only. The exchange rate volatility in these countries expected by the markets has recently been falling from the peaks observed in 2008 H2, but is still higher than before 2008.

The Czech economy's strong **trade and ownership links** with the euro area magnify the benefits arising from the elimination of potential fluctuations in the exchange rate. Following Slovakia's entry, the euro area is the partner for approximately 70% of Czech exports, a level comparable to, or even higher than, in the other countries under review. The Czech economy's ownership links with the euro area on the direct investment inflow side are relatively strong and still growing. The Czech economy's strong economic integration with the euro area creates conditions for increasing economic alignment with this area. Another positive aspect from this perspective is the high intensity of intra-industry trade with the euro area, which is only slightly lower than in Austria and Germany.

The analysis of the Czech **financial system**, and, within it, the banking sector, reveals that despite its smaller share in GDP and smaller depth of financial intermediation relative to the average for the euro area and its founding member countries, common features of the effect on the economy usually prevail, particularly in normal economic conditions. Nevertheless, the current global financial crisis and recession have shown that only a sufficiently capitalised banking sector which is independent of external financing and has high balance-sheet liquidity and which in the run-up to euro adoption focuses on the traditional business model of conservative banking intermediation mostly in the domestic currency, is highly resistant to shocks. In this situation, the reaction to asymmetric shocks arriving from global financial markets is much more effective as regards ensuring the functioning and effectiveness of the system. By contrast, banking sectors which were dependent on external funding and which – owing to over-optimistic expectations regarding early euro adoption – recorded large volumes of asset transactions in foreign currencies were hit hard by the negative external shock.

The ratios of client loans to total loans and GDP had been increasing over the past seven years as a result of dynamic growth in lending to households and corporations in the Czech Republic. On the one hand, this trend implied convergence towards the corresponding ratios in the euro area. On the other hand, the historical experience of some countries shows that strong growth in lending and rising household and corporate debt can lead to a higher loan default risk in an adverse economic situation. However, the recent recession-related slowdown in lending in the Czech Republic and greater prudence on the part of both banks and borrowers are suppressing any risk of overleveraging of the real sector.

Given their minimal exposure to toxic and other very risky assets, domestic financial institutions have not been hit significantly by the global financial crisis. However, some of them are exposed to the financial crisis to a limited extent through their investments in foreign bonds, shares, mutual fund units and, in some cases, real estate. However, the fall in the value of their assets due to revaluation has had no fundamental effect on the functioning of the domestic financial system. It is thus reasonable to assume that the indirect effect of the crisis – acting via a worse financial situation of households and corporations and manifesting itself mainly in a probable increase in the loan default rate in the future period – will be dominant.

The structure of the financial assets and liabilities of Czech non-financial corporations and households still differs from that of euro area entities. The difference is particularly visible in a higher share of trade receivables in corporate assets and a higher share of currency and deposits in household assets. However, gradual convergence towards the euro area structure can be observed. The indebtedness of Czech corporations and households is currently significantly lower than in the euro area countries under review. In the past, the effect of money and financial market rates on client rates in the Czech Republic was roughly the same as in the euro area, but the economic crisis has led to slightly greater stickiness of client rates in the Czech Republic. The interest rate sensitivity of new loans to non-financial corporations is similar to that in the euro area. Households have a larger weight of long-term rate fixations in the case of loans for house purchase. The use of the euro in the financial transactions of non-financial corporations is gradually growing, reflecting the Czech economy's openness and foreign trade integration. However, the degree of spontaneous euroisation is still relatively low, although there is a difference between corporations and households. The expansion of foreign currency cash holdings and deposits of households in the Czech Republic is roughly comparable with the selected Central European countries, but foreign currency borrowing is negligible.

The degree of **integration of the Czech financial markets** (money, foreign exchange, bond and stock) with the euro area markets is similar to that in the new EU Member States under comparison. The integration of government bond and stock markets is also comparable to that of Austria and Portugal. The speed of elimination of shocks on the Czech financial markets had been increasing since 2002, but the speed of adjustment has recently declined somewhat (except on the government bond market) as a result of the global financial crisis. The financial crisis has loosened financial market integration in all the countries under comparison over the last two years. In contrast, the sensitivity of asset prices to global events has been developing unevenly across the individual countries following the outbreak of the financial crisis. In the Czech Republic it has increased somewhat in the foreign exchange and stock markets.

Adjustment Mechanisms

As regards the **public finance** of the Czech Republic, their ability to stabilise the economy subject to the European fiscal rules will be important. Under the Stability and Growth Pact, the Czech Republic committed itself to steering over the medium term towards a structural government deficit of no more than 1% of GDP by 2012. The closer the structural part of the

public budget deficit is to zero, the more room there will be at a time of economic downturn for the functioning of automatic stabilisers and the potential implementation of discretionary measures. After improving in 2007, the structural deficit in the Czech Republic increased again in 2008 owing to measures adopted on the budget revenue side and to faster growth in some expenditures. The evolution of the structural deficit is also very negative in 2009, as a result of anti-crisis and other measures. Although the elimination of adverse structural effects should remain a high priority for the Czech Republic, fulfilment of this target represents a big challenge at present despite measures adopted in autumn 2009 to stabilise the public budgets. Owing to the deficit budget outlook, growth in public debt is expected as well. The past downward trend in the ratio of public debt to GDP will thus be interrupted in the Czech Republic. Although the problem of public debt is less serious for the Czech Republic than for most of the countries under comparison, its ratio to GDP is likely to approach 40% as early as 2010. In the context of the current economic slowdown, the rise in mandatory debt service expenditure along with the expected effect of demographic changes on pension system and health care system expenditures poses a risk to the sustainability of public finance.

Wage elasticity can enhance the economy's ability to absorb the shocks to which the single monetary policy cannot respond. The analyses indicate that real wage elasticity in the Czech Republic was low in the past, as in the other countries under comparison. However, nominal wages have been showing signs of flexibility over the last two years. The current crisis is hitting corporations mainly in terms of reducing demand. Around two-thirds of corporations are responding to the crisis by freezing wages. Other ways of cutting labour costs are also being employed, for example a shorter working week. The response of reducing nominal wages is less widespread, but as in the case of wage freezes is more common than before the crisis. Differences in **inflation persistence** in the countries of the monetary union might lead to different impacts of the single monetary policy. Inflation persistence in the Czech Republic is medium-low among the countries under comparison.

The Czech **labour market** situation reflects the impacts of the recent economic downturn. Thanks to the lag with which the current growth in total unemployment is spilling over to long-term unemployment, some improvement was still observed in some of the 2008 data (as in the other countries under comparison), but a significant rise in long-term unemployment can be expected in 2009 and 2010. The analyses also indicate that the decline in unemployment in the Czech Republic in the previous period was largely cyclical and that structural unemployment is unlikely to have improved markedly.

As in some of the other countries under review, the Czech Republic has persisting relatively large regional differences in the unemployment rate. This is due to regional gaps between the demand for, and supply of, labour and the low regional, occupational and sectoral mobility of the labour force, exacerbated, among other things, by the dominance of owner-occupied housing. It is thus reasonable to expect that the contribution of cross-border mobility of Czech citizens to the adjustment in the event of economic imbalances will be relatively limited, even after the movement of labour between the Czech Republic and all the original EU countries has been fully liberalised by 2011. The dynamic inflow of foreign labour into the Czech Republic visible since 2005 has recently slowed, or the number of foreign workers has already started falling, reflecting the decline in labour demand. This flexible response to economic developments can be regarded as a sign of flexibility of the Czech labour market. On the other hand, the use of foreign labour during the economic boom suggested that some serious problems persisted in this market (in particular low incentives to work among the long-term unemployed with low skills), since foreigners work mainly in low-skilled jobs.

Labour market flexibility is determined to a great extent by the **institutional rules**. The effect of collective bargaining on wage setting is no higher in the Czech Republic than in the current

euro area members. The impact of the minimum wage on the flexibility of low wages and on job creation is rather low on average by international comparison. The halt in growth, or slight decline, of the minimum wage as a percentage of the average wage for less-skilled jobs can be regarded as positive, since high minimum wages coupled with high labour taxation could have an adverse effect on demand for less-skilled labour. At the same time, the labour force in the Czech Republic in 2007 was exposed to the highest tax burden of all the countries under comparison as measured by the implicit tax rate. The 2008 tax reform reduced the tax burden on most households, but for households of individuals without children, labour taxation at the average wage level increased slightly due to “cold progression”. The adverse effect of taxation on long-term unemployment and job creation was roughly the same as in Austria, Hungary and Poland, but higher than in Portugal and Slovakia. The financial incentives for the Czech unemployed to accept a job given by the combination of taxes and benefits declined as a result of the 2007 social benefit system reform. Although the 2008 reform halted the adverse trends, it did not deliver a significant reduction of the existing problems. The level of social benefits coupled with the tax burden may diminish efforts to seek or keep a job, particularly in the case of households with children, but unemployment benefits are high by international comparison even for childless individuals. In the area of permanent employment, the degree of job protection is higher than in other countries, whereas the protection of temporary employment and agency employment is relatively low. The costs of dismissing employees in the Czech Republic are independent of the duration of employment and are therefore relatively high by international comparison particularly with regard to short-term contracts. Moreover, the institutional set-up of the labour market in the euro area should be regarded as a relatively soft standard for international comparisons. Low flexibility may present a general risk in particular as regards the entry of young people to the labour market.

In the area of **product market flexibility** the situation is showing a gradual partial improvement. In particular, gradual steps are being taken to simplify the procedures for setting up businesses and carrying on business activities. However, the domestic business environment continues to be more burdened with administrative obstacles than that in most of the countries under comparison, partly because of a current gradual improvement in the business environments in those countries. As in the other countries under comparison, the corporate taxation rate has been declining recently and is currently one of the lower ones, but the overall tax burden on Czech corporations is higher than in Portugal, Hungary, Poland and Slovakia.

Stability and effectiveness of the banking sector is a precondition for the sector to be able to assist in absorbing economic shocks. The banking sector has achieved a high level of efficiency and profitability in the European context, and in past years has created a sufficient capital reserve from its profits. Banks have tightened the availability of loans for reducing the impacts of the deepening recession so as to absorb risks and not endanger the admissible regulatory capital ratios for banking business. By increasing capital out of the previous year’s retained earnings, the Czech banking sector achieved a capital adequacy ratio of 13.7%, thereby creating a larger buffer against potential losses. While the governments and central banks of other countries responded to the build-up of losses in the global financial system with numerous measures aimed at bolstering the balance-sheet liquidity and solvency of key institutions, the Czech Republic was not forced to adopt any additional measures to strengthen banking sector solvency. Nonetheless, the slump in economic activity will show up in the Czech financial system in the form of rising credit risk and worsening quality of the banking sector’s loan portfolio. Stress test results indicate that even a highly unfavourable macroeconomic scenario should not be negatively reflected in the stability of the banking

sector. According to the tests, and also by international standards, the Czech banking sector seems to be resilient to risks and does not require any capital injections implying fiscal costs.

Box 1: Euro adoption in Slovakia

This box describes Slovakia's situation in terms of economic preparedness for euro adoption. It summarises the formal steps of Slovakia prior to euro adoption, assesses the degree of alignment of the Slovak economy with the euro area and finally presents an estimate of the effects of the fixing of the exchange rate of the koruna prior to euro adoption on the performance of the Slovak economy at a time of recession.

Euro area entry proceeded without any technical problems. On 1 January 2009, the euro became the official currency in Slovakia. This took the number of euro area member countries to sixteen. Euro adoption was preceded by several important steps. In July 2005, Slovakia adopted a National Changeover Plan setting out its preparation strategy for euro adoption and setting a date for euro adoption. Slovakia chose a changeover scenario with no transitional period (the “big bang scenario”), characterised by simultaneous changeover for cash and non-cash payments and a very short dual circulation period. The National Changeover Plan was updated twice. A further necessary step towards adopting the single currency was inclusion in the European Exchange Rate Mechanism II (ERM II), which the Slovak koruna entered on 25 November 2005 with a central rate of SKK 38.455 to the euro. This was followed by a stay of more than three years in ERM II. Prior to the euro adoption decision and the setting of the koruna-euro conversion rate on 8 July 2008, the central rate was revalued twice to SKK 30.126. Thanks in part to this, the Slovak koruna managed to stay within the permissible fluctuation band of $\pm 15\%$ around the central rate during its stay in ERM II. This was subsequently assessed as successful fulfilment of one of the convergence criteria for euro area entry. Slovakia experienced no immediate rise in inflation as a result of the euro changeover. The changeover has also fundamentally changed the position and role of the National Bank of Slovakia (NBS), which is now part of the Eurosystem (comprising the ECB and the central banks of the euro area member states) and is jointly responsible for the single currency and the implementation of the single monetary policy in the euro area.

Euro adoption has brought benefits to the Slovak economy in many areas. Costs associated with international transactions have been reduced. In the long run, greater price comparability will also be a benefit, leading to greater competitiveness. The disappearance of the volatility of the Slovak koruna against the euro and of the related uncertainty regarding its future exchange rate against the euro is important for the business sector as well. The significance of exchange rate stability has additionally increased at a time of global financial crisis accompanied by significant volatility in asset markets and cross-border transfers of capital. On the one hand, from the optimum currency area theory point of view the Slovak economy has the right preconditions for functioning well with the euro. On the other hand, however, there are also areas that pose certain risks to the economy going forward.

Slovakia is facing some challenges linked with real convergence. In 2008, Slovakia was at a similar economic level to Portugal, with GDP per capita expressed in purchasing power parity at 67% of the euro area average. The price level in Slovakia in 2008 stood at 64% of the euro area average and, as in the case of the Czech Republic, was below the value consistent with its economic level. The real HICP-based exchange rate of the Slovak koruna against the euro appreciated at a pace of 6.3% a year between 1998 and 2008, the highest figure among the countries under review. Given the predicted convergence in the economic level and the related rise in the price level, the equilibrium real appreciation trend of the koruna can be expected to continue at a pace of 1.6%–2.7% over the next five years. This will be reflected in an equally high inflation differential vis-à-vis the euro area average. However, the risk of unbalanced economic developments which might result from this is mitigated by the fact that the Slovak economy has operated with low or negative real interest rates in past as well.

Slovakia, together with the Czech Republic, has the least similar structure of economic activity as compared to the euro area average. The difference consists mainly in a high share of industry and a lower share of services. The indicators of business cycle alignment and the occurrence of economic shocks have recently been indicating a rise in correlation, mainly as a result of the ongoing global economic crisis, which is acting as a common shock. According to previous years' analyses, the evidence on cyclical alignment was rather mixed. Interest rates had been relatively close to the

corresponding euro area rates since 2005. The long-term interest rate differential vis-à-vis the euro area has risen to slightly positive values recently, as in Slovenia and the Czech Republic, but much less so than in Poland and Hungary. The exchange rate of the Slovak koruna has recently been showing high but relatively volatile correlation with the euro, and its overall volatility has been rather lower. An analysis of fundamental factors of exchange rate volatility for Slovakia indicates a slightly lower need for exchange rate adjustment than in the other new EU Member States.

Slovakia trades with euro area countries the least of the new EU Member States under comparison. Exports to the euro area account for just over 50% of total exports and imports from the euro area for around 40% of total imports. Of the countries under comparison, only Germany has a lower share of trade with the euro area on the export side. Together with Slovenia, the intensity of intra-industry trade is the lowest of the countries under comparison. Slovakia's ownership links with the euro area through foreign direct investment are slightly lower than the Czech Republic's.

Despite some differences, the financial market shows an ability to operate in a standard manner. Slovakia has a smaller depth of financial intermediation than the euro area average, and its ratio of financial system assets to GDP was one-third of the figure for the euro area in 2008, the same as its ratio of loans to GDP. Like the Czech banking sector, the Slovak banking sector has a good capital position, a high ratio of primary client deposits to loans and solid performance and profitability. The share of non-performing loans in total banking sector loans kept declining in 2008 and was the lowest of the countries under comparison. The structure of financial assets and liabilities of corporations and households is largely similar to the structure prevailing in the euro area, except for somewhat higher cash holdings and deposits by Slovak households. Unlike in the other new member countries under comparison, the alignment of most segments of the Slovak financial market with the euro area increased following the outbreak of the financial crisis, probably owing to expected euro adoption.

Slovakia's public finance outlook has worsened substantially as a result of the economic downturn and fiscal deficits of around 5% are expected for 2009 and 2010. Slovak public finance is showing a relatively high structural deficit. The debt level is the second-lowest of the countries under comparison behind Slovenia and slightly lower than in the Czech Republic. Population-ageing costs are currently estimated as comparable to or slightly lower than in the Czech Republic.

The institutional set-up is not significantly constraining labour market flexibility, but high unemployment is still a problem. A high rate of long-term and structural unemployment persists on the Slovak market, amid growing regional differences in unemployment. As in the Czech Republic, wage flexibility is low. A rise in the ratio of the minimum wage to the average wage in 2007 to the highest value among the countries under comparison is an adverse development. By contrast, a favourable trend is being recorded in labour taxation and in the settings of tax and benefit system towards higher incentives for the unemployed to accept employment. The employment protection legislation is less strict than in the Czech Republic for the dismissal of individuals from permanent employment and temporary employment, although it is markedly stricter for the collective dismissal of employees. The rules for starting and closing a business in Slovakia are much simpler than in the Czech Republic and the administrative barriers to business are rather lower.

The fixing of the Slovak koruna's exchange rate to the euro at a markedly stronger value relative to the long-term appreciation trend had a significant effect on the international competitiveness of the Slovak economy. In order to quantify the direct impact of the fixing of the Slovak koruna on exports and imports, an error correction model – described in more detail in the *Methodological Part* – was constructed. This model was used to simulate the evolution of exports and imports given a hypothetical more depreciated exchange rate path of the Slovak koruna. This is derived from the average depreciation of the exchange rates of the currencies of Slovakia's neighbouring countries (the Czech Republic, Poland and Hungary) in the period 2008 Q3–2009 Q1. The results of the simulations indicate a negligible impact in 2008 Q3. Then, in 2008 Q4, given the more depreciated exchange rate, net exports would increase by 0.2% of GDP, exports would rise by 2.4% of GDP and imports would go up by 2.2% of GDP. The biggest impact is observed in 2009 Q1, when net exports would increase by 0.7% of GDP, exports by 6.6% of GDP and imports by 6.0% of GDP. The robustness of the results was tested by simulations with alternative real exchange rate

specifications. The baseline version works with the real exchange rate based on industrial producer price indices. The impacts are somewhat higher with the CPI-based real exchange rate, the impact on net exports being 0.3% and 0.8% of GDP in 2008 Q4 and 2009 Q1 respectively. Using the real exchange rate based on unit labour cost indices the effects on net exports are somewhat smaller: 0.2% of GDP in 2008 Q4 and 0.5% of GDP in 2009 Q1. A control simulation of the effects of hypothetically fixing the koruna's exchange rate at the same time as Slovakia was conducted for the Czech economy using the CNB's "g3" core prediction model. This simulation leads to somewhat greater effects on the slowdown in export growth and the deterioration in net exports and, as a result, to lower growth in Czech GDP in 2009 by around 1.5 percentage points.

The results of the impacts of euro adoption on the Slovak economy are supported by alternative evidence. One of the shortcomings of the above model is that in the case of imports no statistically significant relationship has been found between changes in the real exchange rate and changes in imports (however, an indirect relationship does exist via a high import intensity of exports). Nevertheless, the effect of a change in the real exchange rate on imports can partly be read from the data when one compares the evolution of household consumption and retail sales. When the exchange rate of the Slovak koruna is overvalued, border areas of the Czech Republic, Poland and Hungary experience increased purchases by households. These purchases abroad are included in household consumption and are de facto imports of goods and perhaps of certain services. By contrast, retail sales indicators cover domestic purchases only. The economic data for 2009 Q1 reveal a more than 10% year-on-year fall in real retail sales contrasting with just a 0.3% year-on-year rise in real household consumption. Similar conclusions can be drawn by examining the long-term rolling correlation of household consumption and retail sales, which is falling at the end of the period under review.

To sum up, the euro changeover in Slovakia proceeded without any problems from the organisational and technical points of view. Transaction costs were reduced and unjustified upward pressures on prices were successfully eliminated. The fulfilment of the Maastricht criteria testifies to the achievement of nominal alignment of Slovakia with the euro area economy in terms of the key parameters (inflation, interest rates, public finance and the exchange rate). From the point of view of optimum currency area theory, Slovakia was in a better position prior to euro adoption than the Czech Republic is now, particularly as regards the institutional set-up of its labour and product markets. By contrast, Slovakia will face bigger challenges due to its greater distance from the euro area in terms of economic and price level. This will exert upward pressure on the inflation differential in Slovakia. Slovakia is in many respects rather vulnerable and its membership in the euro area provides it with protection against the adverse effects of unpredictable changes in global investor sentiment and related hectic transfers of financial capital at times of global financial and economic crisis. Nevertheless, it should be added that the fixing of the Slovak koruna's exchange rate in the summer of last year (the setting of the conversion coefficient) occurred at probably the least appropriate moment given the markedly overvalued real exchange rate at the time. Slovak producers' ensuing loss of price competitiveness exacerbated the impacts of the world financial and economic crisis on the Slovak economy as a whole.

C THEORETICAL FOUNDATIONS OF THE ANALYSES

The basic theoretical starting point for the analyses contained in this document is the theory of optimum currency areas.³ This theory is one of the approaches often used to determine the appropriate exchange rate regime and, in particular, to determine whether the countries included in the analysis are good candidates for introducing a single currency. In the context of the creation of the single European currency, knowledge of this theory has been used recently to assess the appropriateness of adopting the single currency by the euro area countries and the suitability of the same step for the new EU Member States.

Generalising somewhat, one can say that economists agree on the set of fundamental benefits and costs of the single currency, although this set may change over time or depending on the specific features of individual economies. The benefits consist chiefly in the improvement in the functionality of money and a decline in transaction costs (including, for example, the greater usability of the single currency, easier comparability of prices, a reduction in transaction costs, and the elimination of exchange rate risk and the costs of hedging against it) and increased macroeconomic and financial stability, reflected in a more favourable environment for investment (thanks to the elimination of excessive exchange rate fluctuations, financial market integration, an increase in price stability and potentially an overall increase in the credibility of the monetary authority).⁴

The costs can be broken down into two groups. There are the costs associated with the change of legal tender, including the physical exchange of money, the conversion of all contracts to the new accounting unit, and similar costs, i.e. costs which can be viewed, to a large extent, as non-recurring.⁵ The main long-term costs include in particular a reduction in the effectiveness of domestic macroeconomic policies and the risk of greater volatility in output and consumption, because with transition to the single currency the economy will lose its independent exchange rate and interest rate policies. The single monetary policy will not be able to respond sufficiently to shocks which affect only a small part of the currency area's economy. The costs of this loss will depend on the extent to which the exchange rate of the national currency absorbs real shocks or, on the contrary, generates real and/or financial shocks, on the degree of alignment of the business cycle with the cycle to which the currency area's monetary policy responds, and on the ability of the economy to employ other adjustment channels.⁶

³ The papers by Mundell (1961), McKinnon (1963) and Kenen (1969) are regarded as the cornerstones of this theory. A survey of this literature can be found, for example, in Mongelli (2002), De Grauwe (2003) or Horváth (2003).

⁴ The increased macroeconomic stability and lower risk will facilitate a low and relatively stable interest rate level and higher investment growth. An increase in foreign trade and competition, productivity growth and subsequent GDP growth per capita can also be expected. However, financial market integration may be a drawback at times of financial crises, which may spill over to other countries, as current developments show.

⁵ In the context of transition to another currency, there is also a risk of incorrectly setting the conversion ratio, as an excessively appreciated exchange rate may damage the competitiveness of the economy in the long term, while an excessively depreciated exchange rate will generate inflationary pressures (see the discussion for Slovakia in the box: "Euro adoption in Slovakia").

⁶ From the viewpoint of the new EU members who are planning to join the euro area, another cost may be the fulfilment of the Maastricht criteria prior to entry, especially the price stability criterion. Another potential cost for converging countries is a persisting inflation differential, which may be reflected in a rise in nominal client rates and, conversely, a fall in real client rates and have an adverse effect on the economy (the welfare cost of inflation theory – Lucas, 2000, and Ireland, 2008).

However, despite the more than 40-year history of the above theory, the consensus is that there is no unambiguous definition of an optimum currency area. The potential costs and benefits differ depending on the specific situation, and political decisions play a significant role in the selection of exchange rate regime. Similarly, there is no method which in practice can unambiguously measure the potential benefits and costs associated with fixing the exchange rate and entering a monetary union (Vaubel, 1990). However, the current level of knowledge in this field can, *inter alia*, be used to identify potential sources of macroeconomic imbalances associated with entering the monetary union and to assess the ability of the economy to benefit from such a move. Properties that reduce the usefulness of nominal exchange rate adjustments by fostering internal and external balance, reducing the impact of some types of shocks and facilitating adjustment, make up the set of “optimum currency area properties” (Mongelli, 2002).

One of the key properties determining the appropriateness of joining a currency area is the degree of the openness of the economy and its economic links with the other countries of the currency area. The greater the integration, the higher the potential benefits of the single currency against which the costs are gauged. These benefits reflect above all the elimination of exchange rate risk in economic relations, which will reduce the costs of foreign trade and foreign investment and may lead to a strengthening of such relations (e.g. Rose, 2000). Micco, Stein and Ordonez (2003) have found this effect to be economically significant for the euro area countries. Baldwin (2006), on the other hand, points out that euro area accession cannot be expected to have such an upward impact on foreign trade as implied by the results set out in the earlier literature. According to his results, the introduction of the euro itself tends to act as a non-discriminating unilateral liberalisation of the product market and could therefore have a greater impact on a country’s imports than on its exports.⁷

Other properties tend to reduce the negative aspects of the loss of certain macroeconomic adjustment instruments at country level, and can be summarised under the heading of symmetry and flexibility (De Grauwe and Mongelli, 2005). The traditional optimum currency area criteria therefore also include similar economic structure and economic shocks, output and consumption diversification, a similar inflation rate, stable terms of trade, mobility of labour and other production factors, price and wage flexibility, and fiscal and political integration.⁸

Crucial to the discussion on the benefits and costs of the single currency was the formulation of the opinion that not only can the ability to benefit from a monetary union and the risks of unbalanced developments in a monetary union be affected by appropriate reforms, but that large shifts also seem to result from the very introduction of the single currency (the “endogeneity hypothesis”, Frankel and Rose, 1998). According to this hypothesis, the adoption of the single currency should lead to a strengthening of the free market (Engel and Rogers, 2004) and growth in trade with partners in the monetary union. Greater trade

⁷ A developed financial sector is capable of effectively reducing exchange rate risk even outside the currency area; in such case, the overall net benefits of currency integration may be lower than for a country with a less developed financial sector.

⁸ In the event of an asymmetric shock, fiscal policy can assist by means of either built-in stabilisers or discretionary measures. However, discretionary measures can give rise to further fluctuations (Feldstein, 2002). What is more, research has shown that a fiscal expansion can have a much lower impact on demand than expected (Blanchard and Perotti, 2002).

integration can lead to greater business cycle correlation (Frankel and Rose, 1997).⁹ As regards the introduction of the euro in the new Member States, however, this channel acting via an increase in the share of mutual trade is likely to be fairly weak (Baldwin, 2006).¹⁰

The endogeneity paradigm is opposed by the view that greater openness of the economy leads to a greater degree of specialisation, a decrease in structural similarity and thus a higher probability of asymmetric shocks, which increase the costs of currency area participation (the “specialisation hypothesis”, Krugman, 1993). Kalemli-Ozcan, Sorensen and Yosha (2003) find that high financial integration can have a similar impact thanks to risk sharing, which fosters greater specialisation.

De Grauwe and Mongelli (2005) review the literature on the endogeneity of foreign trade, financial integration, symmetry of shocks and product and labour market flexibility. Based on developments to date in the euro area, they conclude that it is more likely that the endogeneity hypothesis holds, i.e. that the similarity of economic shocks probably increases with greater economic integration. By contrast, Giannone, Lenza and Reichlin (2009) state that euro adoption has not significantly changed the characteristics of member countries’ business cycles. In their opinion, countries with lower long-run volatility retain this characteristic after euro area entry. Likewise, the trend in countries with historically higher volatility in economic activity and lower business cycle correlation with the euro area average persists. According to Lane (2006), the introduction of the euro had a clear impact in terms of increasing the integration of the euro area financial markets¹¹; however, there was growth in foreign trade with both members and non-members of the euro area, hence it can be expected that this channel did not unambiguously cause a reduction in the probability of asymmetric shocks.

The empirical literature analysing the nature of economic shocks hitting the euro area countries is divided. Giannone and Reichlin (2006), Eickmeier (2007) and Stavrev (2008) find the significance of common shocks to be decisive in explaining the variability of economic output. The increase in the significance of common shocks is attributed to the effect of the single monetary policy on the synchronisation of cycles. The GDP growth differences among the euro area countries are mostly due to idiosyncratic shocks, i.e. shocks characteristic of individual countries. However, different transmission of common shocks, i.e. shocks hitting the entire euro area, can also have an asymmetric effect. However, the effect of this channel is found to be rather small. In this regard, European Commission (2008) sees risks mainly in the effect and spillover of global imbalances, demand for and prices of commodities, and in the implications of population ageing. By contrast, Artis et al. (2007) argue that the euro area cannot be considered homogeneous from the point of view of response to external shocks. European Commission (2006), in addition to the importance of common shocks, emphasises the significance of idiosyncratic shocks affecting individual countries, in particular a fall in the risk premium after euro adoption, an easing of the monetary conditions, and the development of productivity in the tradable and non-tradable sectors. As a result of the monetary policy response, these shocks can also have secondary impacts on other countries.

⁹ However, Kenen (2000) finds that although trade intensity can increase the correlation between cycles, asymmetric shocks are not necessarily fully eliminated. Hughes-Hallett and Piscitelli (2002) show that this causality between monetary union participation and cycle alignment exists, provided that the convergence in institutional structures and the symmetry of shocks are sufficient.

¹⁰ A meta-analysis of this literature is provided by Havránek (2009).

¹¹ However, the experience of the recent global financial and economic crisis suggests that increasing financial market integration is not necessarily an unequivocally appropriate feature for the healthy functioning of an economy in a monetary union.

D RESULTS OF THE ANALYSES

1 CYCLICAL AND STRUCTURAL ALIGNMENT

Greater similarity in the structure economic of activity and the business cycle between the Czech Republic and the euro area will lead to lower euro adoption costs.¹² For the Czech economy, the risk of time misalignment or a suboptimal intensity of the response of the single monetary policy to economic shocks will decrease. The functioning of the monetary policy transmission mechanism will also converge. The direct indicators of alignment (describing various aspects of convergence with the euro area) and the effect of international relations and the financial sector (which can increase or decrease alignment) are both monitored.

1.1 Direct alignment indicators

The principal direct alignment indicators are the development of domestic economic activity, the exchange rate and interest rates compared to the euro area. Convergence in economic and price levels increases the likelihood of similar processes proceeding in the economy and of there being no major differences in equilibrium development. High synchronisation of economic developments and economic shocks increases the probability that economic developments will not differ substantially going forward, either. Disequilibrium pressures could stem from different economic structures and from insufficient convergence at the interest rate level.

1.1.1 Real economic convergence

The degree of real convergence, as measured by GDP per capita at purchasing power parity and the relative price level of GDP, is a fundamental indicator of an economy's similarity to the euro area. A high degree of real convergence is not a necessary condition for joining the monetary union, but a low degree of real convergence could indicate some challenges for the adoption of the single currency. The real convergence process is often associated with the alignment of price levels and relative prices with more advanced countries. The related real appreciation of the exchange rate vis-à-vis the euro may make fulfilment of the Maastricht convergence criteria more difficult and, in the run-up to joining the euro area, necessitate a combination of economic policies which will move the economy away from equilibrium.¹³ This departure from equilibrium can be viewed as a type of asymmetric shock acting primarily in the initial years of monetary integration. Following the adoption of the euro, price convergence will imply a positive inflation differential compared to the euro area average because the option of a real strengthening of the exchange rate through nominal appreciation will be closed. One of the consequences, given the elimination of the risk premium thanks to euro adoption, will be lower real interest rates compared to both the pre-euro adoption period and the euro area average. Real interest rates may even be negative in some cases. Although

¹² On the other hand, achieving a high degree of alignment in some areas, e.g. convergence of nominal interest rates, however, may at the same time reduce the benefits of the single currency.

¹³ The simultaneous restriction placed on the inflation differential and the appreciation of the nominal exchange rate represents an implicit restriction on the appreciation of the real exchange rate. If the equilibrium real appreciation is faster than this restriction, the fulfilment of the Maastricht convergence criteria may require a temporary departure of the exchange rate from equilibrium, with impacts on the development of the entire economy. However, this potential problem is mitigated by the fact that the exchange rate criterion is significantly more tolerant of appreciation than depreciation.

the lower real interest rates may have many favourable impacts, they may also create some challenges to macroeconomic and financial stability and thus raise questions about the appropriateness of the single monetary policy for an accession country.

As Table 1 shows, the Czech economy is converging gradually towards the euro area in terms of **GDP per capita**. With this indicator currently at almost 75% of the euro area average, the Czech Republic ranks between Slovakia and Portugal on the one hand and Slovenia on the other, i.e. it has a standard of living comparable with the least advanced countries of the monetary union. The Czech Republic is more advanced in this regard than the other new EU Member States outside the euro area (Hungary and Poland). However, it still lags well behind the wealthier euro area countries (Austria and Germany).

Table 1: GDP per capita at purchasing power parity (EA-16 = 100)

	1998	2002	2003	2004	2005	2006	2007	2008
CZ	62	63	66	69	69	71	73	74
AT	117	114	114	117	114	114	114	114
DE	108	104	105	106	106	106	106	107
PT	68	69	69	69	70	70	70	69
HU	47	55	57	58	57	59	58	58
PL	42	43	44	47	46	48	50	53
SI	70	74	75	79	79	81	82	83
SK	46	49	50	52	55	59	61	67

Sources: Eurostat, CNB calculations.

Table 2 illustrates the **price level of GDP** compared to the euro area. In the case of the Czech Republic this indicator shows almost continuous convergence towards the euro area.¹⁴ The Czech Republic still lagged significantly behind not only Austria and Germany, but also Portugal and Slovenia as regards price level in 2008, even though the gap behind these least advanced euro area countries has narrowed in recent years. Of the countries under review, only Hungary, Poland and Slovakia have lower price levels than the Czech Republic.¹⁵

Table 2: Average price level of GDP (EA-16 = 100)

	1998	2002	2003	2004	2005	2006	2007	2008
CZ	44	54	50	51	56	59	61	68
AT	103	103	101	100	103	104	104	105
DE	111	109	105	103	101	101	101	100
PT	78	82	81	82	80	80	80	80
HU	44	54	54	58	60	58	63	64
PL	48	55	48	47	54	56	60	63
SI	71	72	72	70	71	73	76	78
SK	41	43	46	49	51	54	60	64

Sources: Eurostat, CNB calculations.

¹⁴ The exceptions were 1999 and 2003, when the nominal exchange rate saw corrections after previous strong appreciations. It can be assumed that the trend of price level convergence towards the euro area will be interrupted again in 2009. The CNB's forecast published in Inflation Report III/2009 predicts a depreciation of the average nominal koruna-euro exchange rate of around 6.5% this year compared to 2008. The European Commission's May 2009 forecast assumes a real depreciation of the koruna-euro rate of approximately 7%.

¹⁵ Slovakia's price level is likely to surpass the Czech Republic's in 2009 owing to the strong conversion rate set for euro adoption in Slovakia and to the weaker exchange rate of the Czech koruna than in the previous year.

An analysis of the empirical relationship between the price level of GDP and GDP per capita at purchasing power parity for 32 European countries reveals that the Czech price level in 2008 continued to lie below the level corresponding to the performance of the economy. According to the estimated relationship, the Czech price level should be roughly 10 percentage points higher. This, however, is a substantially smaller deviation than in the past.¹⁶

Table 3 presents the **evolution of the real exchange rate** vis-à-vis the euro. Between 1998 and 2008, the real exchange rate of the koruna appreciated roughly by 50%, i.e. at an average rate of 4.2% a year.¹⁷ The rate of real appreciation of the Czech currency is distinctly higher than in the current euro area countries under comparison except Slovakia. In the case of Austria and Germany, the real exchange rate depreciated somewhat. The Polish zloty and the Hungarian forint also appreciated less in real terms than the Czech koruna.

Table 3: Real exchange rate against the euro (1998 = 100; HICP deflated)

	1999	2002	2003	2004	2005	2006	2007	2008	Annual rate of appreciation
CZ	98	121	115	115	122	129	132	151	4.2%
AT	100	99	98	98	98	98	98	98	-0.2%
DE	100	98	97	97	96	96	96	96	-0.4%
PT	102	106	107	107	107	108	108	108	0.7%
HU	104	127	125	131	135	129	143	147	3.9%
PL	98	119	103	101	114	116	120	131	2.7%
SI	100	103	103	102	102	102	104	106	0.6%
SK	98	118	128	140	146	154	170	185	6.3%

Sources: Eurostat, CNB calculations.

The table also shows that the real exchange rate displays significant fluctuations around its long-run appreciation trend. Some of these fluctuations may generate macroeconomic shocks while others may help to dampen them. For example, the appreciation of the Czech koruna in 1998 and in 2001–2002 contributed to two periods when inflation was well below the CNB's target and there was a negative output gap (Šmídková, ed., 2008). By contrast, the koruna's appreciation in 2007 and 2008 H1 amid high inflation and still fast economic growth had a stabilising effect, as did the subsequent depreciation starting in 2008 H2 in a situation of rapidly emerging recession and fading inflationary pressures.

Based on the results of numerous studies (see Čihák and Holub, 2003 and 2005; Brůha and Podpiera, 2007), continued equilibrium real appreciation can be expected for the currencies of the countries striving to join the euro area (the Czech Republic, Hungary and Poland) or which have joined the euro area in recent years (Slovakia and Slovenia). The range of the estimates of the future equilibrium real appreciation, derived using two alternative methods (see the *Methodological Part* for details), is presented in Table 4. In the case of the Czech koruna, this range is 1.3%–3.5%. Compared to the results of the 2008 analyses, the upper boundary of this range has increased owing to an expected decline in the price level (i.e. real depreciation of the koruna) in 2009.¹⁸ Its midpoint is thus now higher than in the current

¹⁶ A decrease in the deviation to about 10 percentage points in 2008 was flagged in last year's analysis.

¹⁷ However, the expected real depreciation of the koruna against the euro in 2009 will probably reduce the long-term average real appreciation since 1998 back towards the value presented in last year's analysis, i.e. 3.2% a year.

¹⁸ The logic of this shift is based on the principle of convergence to the price level in the euro area, where a lower starting level means a higher rate of convergence going forward. Other methods of estimating the equilibrium real appreciation (e.g. Šmídková and Bulíř, 2004) provide different estimates and this principle of convergence does not necessarily apply to them.

members of the euro area, including Slovenia and Slovakia, but slightly lower than in Hungary and Poland.¹⁹ This range corresponds to the average inflation differential vis-à-vis the euro area which could be expected in the Czech Republic if the euro were to be adopted within the next five years. Assuming average euro area inflation of around 2%, inflation in the Czech Republic could therefore increase to about 3.3%–5.5% during the initial years following euro area entry, similarly to the other countries of the region. This would mean a marked increase in inflation compared to the 2% target set by the Czech National Bank from 2010 until euro area entry.

Table 4: Estimate of equilibrium real appreciation (p.p.; annual average for 2010–2014)

	Method 1		Method 2	Range of
	Min	Max		estimates
CZ	2.4	3.5	1.3	(1.3 ; 3.5)
AT	0.4	0.8	-	(0.4 ; 0.8)
DE	0.3	0.5	-	(0.3 ; 0.5)
PT	0.5	0.6	-	(0.5 ; 0.6)
HU	2.5	3.2	2.6	(2.5 ; 3.2)
PL	3.3	4.3	2.8	(2.8 ; 4.3)
SI	1.2	1.7	0.1	(0.1 ; 1.7)
SK	1.6	2.1	2.7	(1.6 ; 2.7)

Source: CNB calculations.

As a result, the Czech Republic and the other countries of the region, such as Slovakia, would face lower **real interest rates** (see Table 5) compared to the average in the euro area and most of the selected Member States (Austria, Germany, Portugal and Slovenia) as well as to the real interest rates they have been facing on average up to now. Their short-term real money-market interest rates would very probably be negative. In the Czech Republic, the three-month real interest rate would drop to -1.7%–0.5% on average.²⁰ Compared to the results of the 2008 analyses, this is a downward shift in the estimate, reflecting the higher upper boundary of the range of the estimated equilibrium real appreciation. On the other hand, the Czech Republic has in the last five years had the advantage of low real interest rates, which implies a need for a relatively smaller future adjustment towards the post-euro adoption situation.

¹⁹ The slightly lower midpoint of the interval vis-à-vis Hungary is given by the results of Method 2, which forecasts a lower rate of real appreciation for the Czech Republic than for Hungary.

²⁰ Three-month interest rates were selected due to the availability of data for all the countries under review for the entire monitored period (see the *Methodological Part*). Twelve-month interest rates would be more appropriate from the economic point of view, but the differences compared to three-month rates are small on average. Twelve-month real interest rates for the Czech Republic following euro area entry would be estimated at -1.6%–0.6%, as compared to an average of 1.4% for the last eleven years and -0.1% for the last five years.

Table 5: Three-month ex-post real interest rates (%; HICP deflated)

	1998	2002	2003	2004	2005	2006	2007	2008	Average	Outlook ^{a)}
CZ	4.2	2.1	2.4	-0.2	0.4	0.2	0.1	-2.1	1.3	(-1.7 ; 0.5)
AT	2.8	1.6	1.0	0.1	0.1	1.4	2.0	1.4	1.5	(1.0 ; 1.4)
DE	2.9	1.9	1.3	0.3	0.3	1.3	1.9	1.8	1.8	(1.3 ; 1.5)
PT	2.1	-0.4	-0.9	-0.4	0.1	0.1	1.8	1.9	0.6	(1.2 ; 1.3)
HU	3.3	3.8	3.6	4.4	3.1	3.1	0.0	2.6	2.9	(-1.4 ; -0.7)
PL	7.7	6.9	4.9	2.5	3.0	2.9	2.1	2.1	5.2	(-2.5 ; -1.0)
SI	2.2	0.5	1.0	0.9	1.5	1.1	0.5	-0.8	1.2	(0.1 ; 1.7)
SK	13.5	4.1	-2.0	-2.6	0.1	0.0	2.4	0.2	1.6	(-0.9 ; 0.2)

Note: ^{a)} Estimated real average interest rate for the next five years derived from the range of the estimated pace of equilibrium real exchange rate appreciation as set out in Table 4, assuming an unchanged nominal exchange rate and a zero risk premium. The nominal rate assumed in the outlook is 3.8% (the sum of the estimated equilibrium real interest rate in the euro area of 1.8% and the inflation rate just below 2% in line with the ECB's definition of price stability).

Sources: Eurostat, CNB calculations.

To sum up, the Czech economy is gradually converging to the euro area level in terms of GDP per capita and the price level. Going forward, however, there is still substantial room for faster growth of economic activity compared to most of the current euro area countries. The equilibrium real appreciation of the koruna associated with this process may thus still pose a challenge to the functioning of the economy in the euro area, in terms of higher inflation and low or even negative real interest rates.

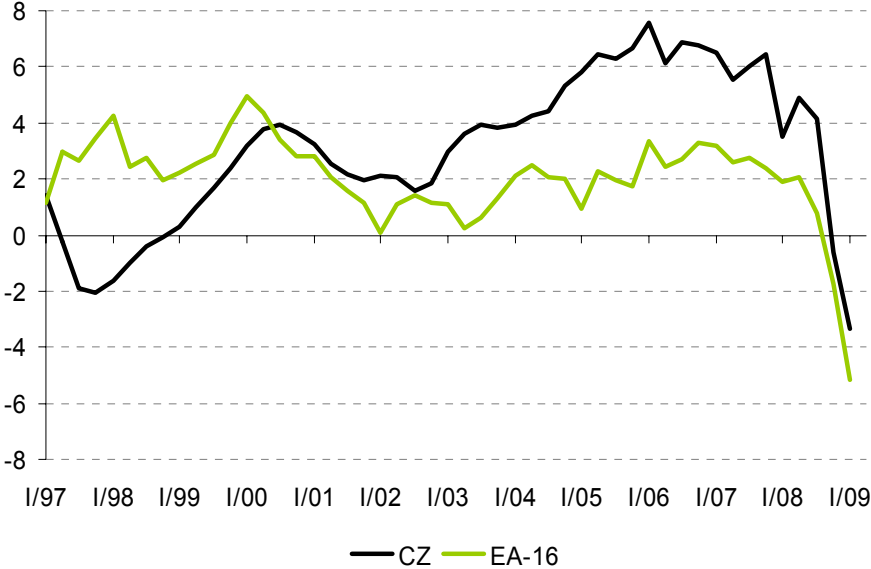
1.1.2 Correlation of economic activity

Upon euro area entry, monetary policy decision-making independence will be replaced by the adoption of single union monetary policy decisions responding to economic developments at the monetary union level. For a country that is in a different phase of the business cycle than the euro area average, such monetary policy setting may be sub-optimal and cause additional economic costs. From the point of view of the optimum currency area theory, participation in the euro area is less costly for a country with a higher business cycle correlation. The analysis below focuses on to what degree the cyclical development of the Czech economy and the other countries under comparison is similar to that at the euro area level.

To measure the cyclical alignment of economic activity in the selected economies with that in the euro area, a simple correlation coefficient and a dynamic correlation method, based on the spectral analysis of time series, have been applied. For comparison, two detrending methods have been applied to the time series under comparison: year-on-year differences on the logarithm of the original time series (Method 1) and quarter-on-quarter (or month-on-month) differences on the logarithm of the seasonally adjusted time series (Method 2). To monitor the evolution of alignment over time, the data have been divided into two periods. This also enables us to isolate the influence of clearly asymmetric developments at the start of the period under review which had non-cyclical causes. Supplementary information on the time development of the correlation of economic activity is provided by an analysis of the correlation for moving five-year time periods (rolling correlation). The analysis deals first with the overall economic activity of the countries under review as described by GDP growth. To obtain a more comprehensive picture, the correlation of economic activity in industry (as measured by the Industrial Production Index, IPI) and the correlation of export activity (the correlation of overall exports of a specific country with overall euro area exports and the correlation of the exports of a specific country to the euro area with euro area GDP) have also been used.

Chart 1 illustrates year-on-year real GDP growth in the Czech Republic and the euro area. Different trends are apparent in these economies at the start of the period under review. The economic decline in the Czech Republic during that period was due to a combination of abating transformation problems, structural changes and specific shocks (such as the 1997 monetary crisis). During 2000–2002, the rate of Czech economic growth copied the adverse trend in the euro area to some extent, although the effect of the external slowdown was magnified by appreciation of the exchange rate. The growth of the Czech economy increased significantly as from 2003 thanks to reforms, increased foreign direct investment inflows following EU entry and changes on the supply side. Economic growth in the euro area countries also rose in this period, but remained significantly slower than in the Czech economy. Economic growth started slowing in 2007 in both the Czech economy and the euro area. This can be interpreted as a shift to a downward phase following the peak of the business cycle. The originally gradual decline in real GDP turned into a sharp year-on-year fall in both economies in late 2008 and early 2009 as a result of the global financial and economic crisis.

Chart 1: Year-on-year changes in real GDP (%)



Note: Data not seasonally adjusted.
 Source: Eurostat.

Table 6 summarises the results of the **simple correlation analysis** for GDP and the IPI. For the first period, neither of the methods finds a statistically significant correlation between GDP growth in the Czech Republic and that in the euro area. This result is not surprising given the aforementioned trend in the Czech Republic in the late 1990s. By contrast, in the second period the correlation of Czech and euro area GDP shows statistically significant values of 0.8–0.9 according to both methods. The substantial increase in correlation can be attributed to some extent to an increase in cyclical alignment, although a significant effect of recent observations – characterised by a sharp economic slump – must also be taken into account. The results are also affected by the previous combination of a cyclical recovery abroad and rising trend GDP growth in the Czech Republic. The correlation coefficients for Slovakia and Slovenia also increased substantially in the second period. Nevertheless, statistically significant and relatively high GDP growth correlations can be identified for all the economies under review. In comparison with other countries, the cyclical alignment of the Czech Republic according to the correlation measured in this phase can be evaluated as above

average. Given the current situation, where there is a high degree of uncertainty as a result of an exceptionally strong global shock, the results should be taken with a pinch of salt as regards their ability to indicate the future trend reliably.

Table 6: Correlation coefficients of economic activity

		1997 Q1–2001 Q4	2002 Q1–2009 Q1	Jan 1999–Dec 2001	Jan 2002–Apr 2009
		GDP	GDP	IPI	IPI
Method 1	CZ	0.10 (-0.29 ; 0.46)	0.88 ** (0.78 ; 0.93)	0.34 ** (0.07 ; 0.56)	0.90 ** (0.86 ; 0.93)
	AT	0.71 ** (0.46 ; 0.86)	0.92 ** (0.85 ; 0.96)	0.90 ** (0.83 ; 0.94)	0.92 ** (0.89 ; 0.95)
	DE	0.92 ** (0.84 ; 0.97)	0.95 ** (0.90 ; 0.97)	0.97 ** (0.95 ; 0.98)	0.98 ** (0.97 ; 0.99)
	PT			0.53 ** (0.29 ; 0.70)	0.66 ** (0.54 ; 0.75)
	HU	0.73 ** (0.48 ; 0.87)	0.70 ** (0.50 ; 0.83)	0.86 ** (0.77 ; 0.92)	0.92 ** (0.89 ; 0.94)
	PL	0.56 ** (0.22 ; 0.77)	0.63 ** (0.40 ; 0.79)	0.78 ** (0.64 ; 0.87)	0.78 ** (0.70 ; 0.84)
	SI	0.47 ** (0.11 ; 0.72)	0.96 ** (0.92 ; 0.98)	0.66 ** (0.47 ; 0.79)	0.93 ** (0.90 ; 0.95)
	SK	-0.69 ** (-0.85 ; -0.43)	0.61 ** (0.37 ; 0.78)	0.48 ** (0.24 ; 0.67)	0.80 ** (0.73 ; 0.86)
Method 2	CZ	0.07 (-0.29 ; 0.42)	0.84 ** (0.72 ; 0.91)	0.13 (-0.16 ; 0.39)	0.35 ** (0.19 ; 0.50)
	AT	0.57 ** (0.27 ; 0.77)	0.74 ** (0.56 ; 0.86)	0.45 ** (0.20 ; 0.65)	0.42 ** (0.26 ; 0.56)
	DE	0.86 ** (0.73 ; 0.93)	0.74 ** (0.56 ; 0.86)	0.88 ** (0.80 ; 0.93)	0.65 ** (0.54 ; 0.75)
	PT			0.23 (-0.05 ; 0.48)	0.51 ** (0.37 ; 0.63)
	HU	0.65 ** (0.39 ; 0.82)	0.80 ** (0.66 ; 0.89)	0.27 (-0.01 ; 0.51)	0.26 ** (0.09 ; 0.42)
	PL	0.37 * (0.02 ; 0.64)	0.54 ** (0.28 ; 0.73)	0.42 ** (0.16 ; 0.62)	0.42 ** (0.26 ; 0.55)
	SI	0.02 (-0.34 ; 0.37)	0.64 ** (0.41 ; 0.79)	0.36 ** (0.09 ; 0.58)	0.40 ** (0.24 ; 0.54)
	SK	-0.51 ** (-0.73 ; -0.19)	0.54 ** (0.27 ; 0.73)	0.20 (-0.08 ; 0.46)	0.31 ** (0.14 ; 0.46)

Note: Method 1 – year-on-year differences; Method 2 – quarter-on-quarter (or month-on-month) differences. The significance of the correlation coefficient is marked ** and * for the 5% and 10% significance levels respectively. The 90% confidence interval is in parentheses.

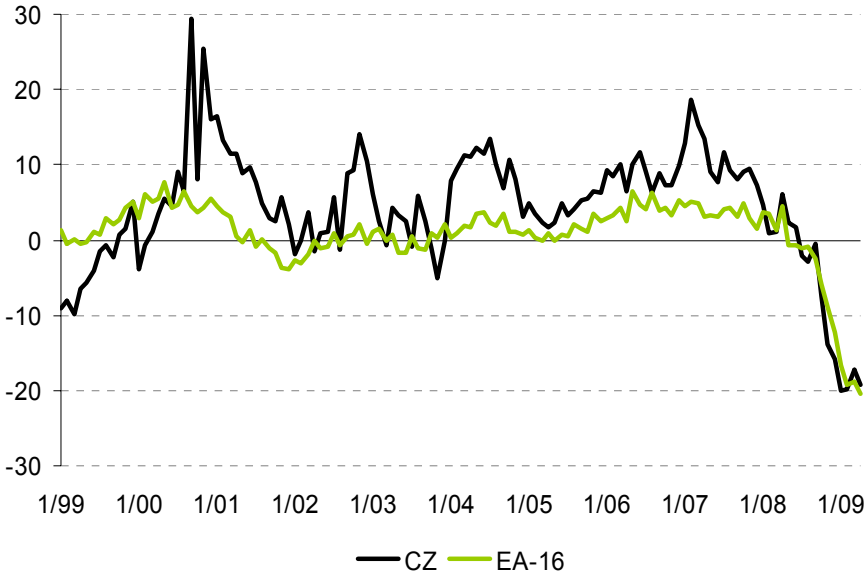
Sources: Eurostat, CNB calculations.

Under Method 1, the correlation analysis of the industrial production index (see Table 6) signals an increase in the correlation between the periods under review for all countries, while under Method 2, shifts in both directions are recorded and the resulting correlations are much lower for all countries compared to Method 1. Generally, however, the positive correlations of the second period are statistically significant in all the countries under review and according to both growth calculation methods.²¹ In the second period, the correlation of the industrial production indices of the Czech Republic and the euro area using year-on-year changes is comparably high as for the other countries. Method 2, on the other hand, indicates a lower degree of alignment of the month-on-month changes. Chart 2 illustrates the specific year-on-year changes in the **industrial production index** in the Czech Republic and the euro area.²² This chart also indicates the strong effect that the synchronised recession in both economies has recently had on the measured correlation.

²¹ The information obtained by comparing the correlation of industrial production is only complementary, as industry typically accounts for less than one-third of total output in the advanced economies, and, moreover, the economies of the countries under comparison also differ in terms of structure (see section 1.1.6). Boone and Maurel (1999) criticise the use of the industrial production index for analysing the similarity of economies and business cycles, because of its high volatility.

²² A change made by Eurostat to the IPP definition is reflected in differences in the results for the first period under review compared to last year's results.

Chart 2: Year-on-year changes in the industrial production index (%)

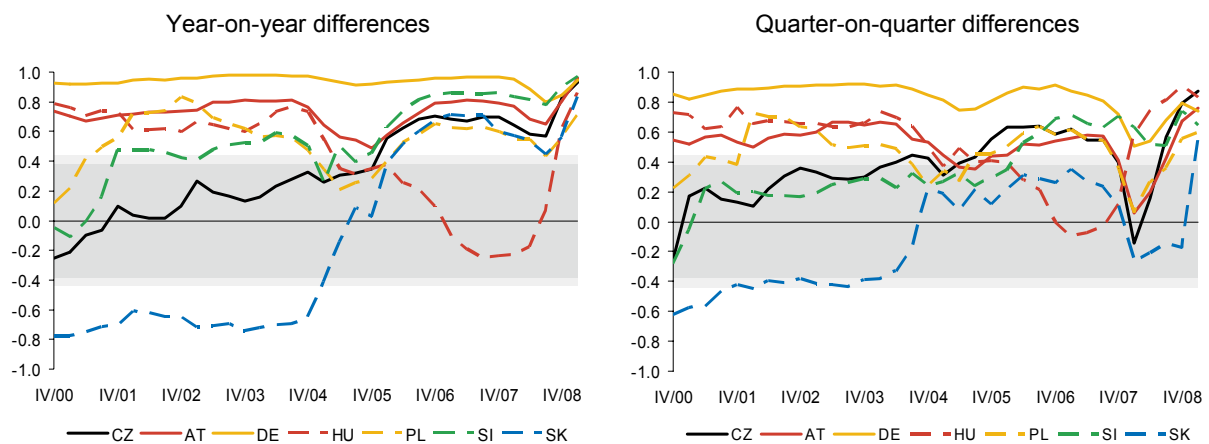


Sources: Eurostat, CNB calculations.

Chart 3 shows the **rolling correlations** of real GDP growth for the two methods. The rolling correlation for the Czech economy under the two methods differs partially, but provides a similar picture of alignment. Under Method 1, the alignment has gradually increased over time, the correlation values having been statistically significant since 2006;²³ following a modest decline in 2007 and 2008, the correlation has continued rising sharply in recent quarters. The rolling correlations calculated on the basis of quarter-on-quarter differences show a temporary fall in the originally rising trend in 2007 Q4–2008 Q4, after which they resume their sharp increase, as in Method 1. This can be explained as being a result of the lag with which the global financial and economic crisis hit the Czech Republic and some other countries in comparison with the euro area average.

²³ The statistical significance of the correlation coefficients is indicated in the chart: values statistically significant at the 5% level lie in the white area of the chart, and values statistically significant at the 10% level lie in the white and light grey parts of the chart. The values in the dark grey part of the chart are not statistically significant at the 10% level.

Chart 3: Rolling correlations of economic activity

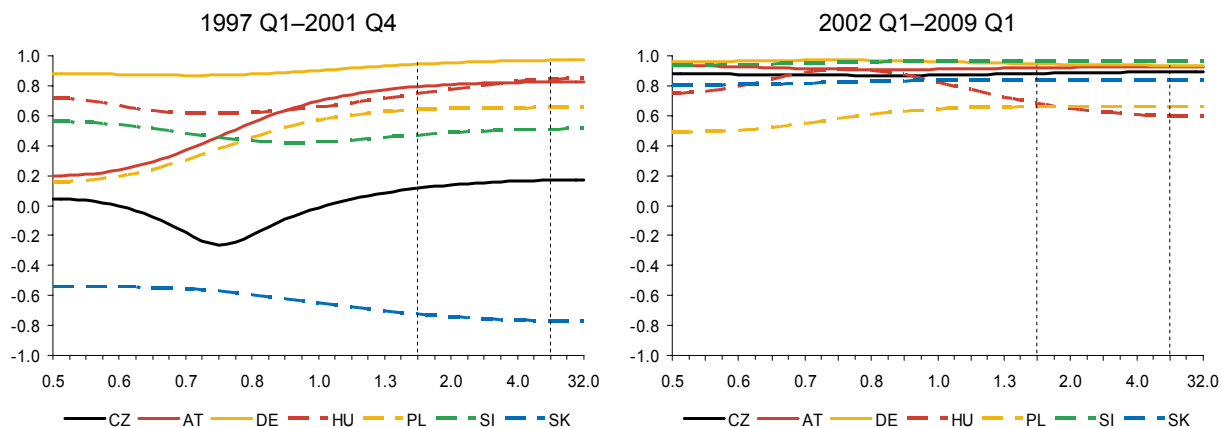


Note: The time data indicate the end of the rolling window of 5 years.

Sources: Eurostat, CNB calculations.

Chart 4 illustrates the results of the **dynamic correlation** using spectral analysis of the time series of annual GDP changes. This method endeavours to separate medium-term economic fluctuations, which correspond to the business cycle, from short-term and long-term movements of the variables describing economic activity. The results of this analysis indicate a fundamental increase in the correlation in the second period across the entire frequency range and across all the countries under review except Hungary.

Chart 4: Dynamic correlations of economic activity (annual changes in real GDP) with the euro area



Note: The x-axis shows the spectrum of possible duration of the cycle in years on a logarithmic scale. The interval depicted by the two vertical dashed lines indicates the cycle length considered, i.e. 1.5–8 years.

Sources: Eurostat, CNB calculations.

The results of the export performance correlation analysis are summarised in Table 7.²⁴ The measured correlations of the total exports of the Czech Republic with the total exports of the euro area are positive and statistically significant in both periods and according to both

²⁴ Compared to last year’s analysis some results saw shifts in the first period due to a change in the method of conversion of exports into national currencies (see the *Methodological Part*).

methods. The estimated parameters are markedly higher in the second period.²⁵ The correlations of Czech exports to the euro area with euro area GDP are lower than the correlations of total exports under Method 1, but comparable under Method 2. Compared to last year's analysis these correlations continued increasing in the second period and turned statistically significant. As with the previous indicators, a large part of the increase in the correlation of Czech export performance and economic activity in the euro area can be explained by the one-off negative shock in the form of the global crisis.

Table 7: Correlation coefficients of overall export activity and exports to the euro area with euro area GDP

		Jan 1997–Dec 2001	Jan 2002–Jan 2009	1997 Q1–2001 Q4	2002 Q1–2008 Q4
		EXP _{TOTAL}	EXP _{TOTAL}	EXP _{to EA-16} vs GDP _{EA-16}	EXP _{to EA-16} vs GDP _{EA-16}
Method 1	CZ	0.53 ** (0.38 ; 0.66)	0.76 ** (0.67 ; 0.82)	0.22 (-0.13 ; 0.53)	0.56 ** (0.30 ; 0.75)
	AT	0.82 ** (0.74 ; 0.87)	0.88 ** (0.83 ; 0.91)	0.70 ** (0.46 ; 0.84)	0.80 ** (0.64 ; 0.89)
	DE	0.95 ** (0.92 ; 0.97)	0.90 ** (0.86 ; 0.93)	0.69 ** (0.45 ; 0.84)	0.87 ** (0.77 ; 0.93)
	PT	0.49 ** (0.33 ; 0.63)	0.84 ** (0.77 ; 0.88)	0.29 (-0.06 ; 0.57)	0.85 ** (0.72 ; 0.92)
	HU	0.54 ** (0.38 ; 0.66)	0.73 ** (0.63 ; 0.80)	0.28 (-0.07 ; 0.57)	0.69 ** (0.48 ; 0.83)
	PL	0.70 ** (0.58 ; 0.79)	0.49 ** (0.34 ; 0.62)	0.67 ** (0.43 ; 0.83)	0.35 * (0.04 ; 0.60)
	SI	0.76 ** (0.66 ; 0.83)	0.67 ** (0.56 ; 0.76)	0.51 ** (0.20 ; 0.73)	0.57 ** (0.31 ; 0.75)
	SK	0.55 ** (0.39 ; 0.67)	0.67 ** (0.56 ; 0.76)	0.04 (-0.31 ; 0.38)	0.57 ** (0.31 ; 0.75)
Method 2	CZ	0.15 (-0.05 ; 0.34)	0.47 ** (0.32 ; 0.60)	0.20 (-0.15 ; 0.51)	0.49 ** (0.20 ; 0.70)
	AT	0.44 ** (0.26 ; 0.58)	0.66 ** (0.54 ; 0.75)	0.33 (-0.01 ; 0.61)	0.63 ** (0.39 ; 0.79)
	DE	0.62 ** (0.49 ; 0.73)	0.64 ** (0.52 ; 0.74)	0.43 ** (0.10 ; 0.67)	0.69 ** (0.48 ; 0.83)
	PT	0.27 ** (0.08 ; 0.44)	0.65 ** (0.53 ; 0.74)	0.11 (-0.24 ; 0.44)	0.63 ** (0.39 ; 0.79)
	HU	0.28 ** (0.09 ; 0.45)	0.44 ** (0.29 ; 0.58)	0.40 * (0.06 ; 0.65)	0.51 ** (0.23 ; 0.71)
	PL	0.13 (-0.07 ; 0.32)	0.60 ** (0.47 ; 0.70)	0.37 * (0.02 ; 0.63)	0.45 ** (0.16 ; 0.67)
	SI	0.24 ** (0.05 ; 0.42)	0.54 ** (0.40 ; 0.65)	0.41 ** (0.07 ; 0.66)	0.47 ** (0.17 ; 0.68)
	SK	0.12 (-0.07 ; 0.31)	0.50 ** (0.35 ; 0.62)	-0.01 (-0.35 ; 0.34)	0.43 ** (0.14 ; 0.66)

Note: Method 1 – year-on-year differences; Method 2 – quarter-on-quarter (or month-on-month) differences. The significance of the correlation coefficient is marked ** and * for the 5% and 10% significance levels respectively. The 90% confidence interval is in parentheses.

Sources: Eurostat, IMF, CNB calculations.

1.1.3 Analysis of cyclical alignment using the Taylor rule

Sufficient cyclical alignment is one of the conditions for successful functioning of a member country's economy in a monetary union. The pro-cyclicality of unified nominal interest rates is often discussed in this context. For an economy in an expansive phase of the cycle with higher inflation and hence lower real rates, this can mean a further increase in its rate of growth. The opposite effect can be observed with an economy in the opposite phase of the cycle with *ceteris paribus* lower inflation and higher real rates (see Björkstén and Syrjänen, 1999). The divergence of optimum monetary policy settings in the individual countries of the monetary union, or their cyclical positions, from the Taylor rule perspective can be analysed using **implied monetary policy measures** estimated on the basis of the Taylor rule.²⁶ This analysis does not seek primarily to estimate the optimum rate settings in a particular economy, but rather sets out to identify approximately the cycles of individual economies.²⁷

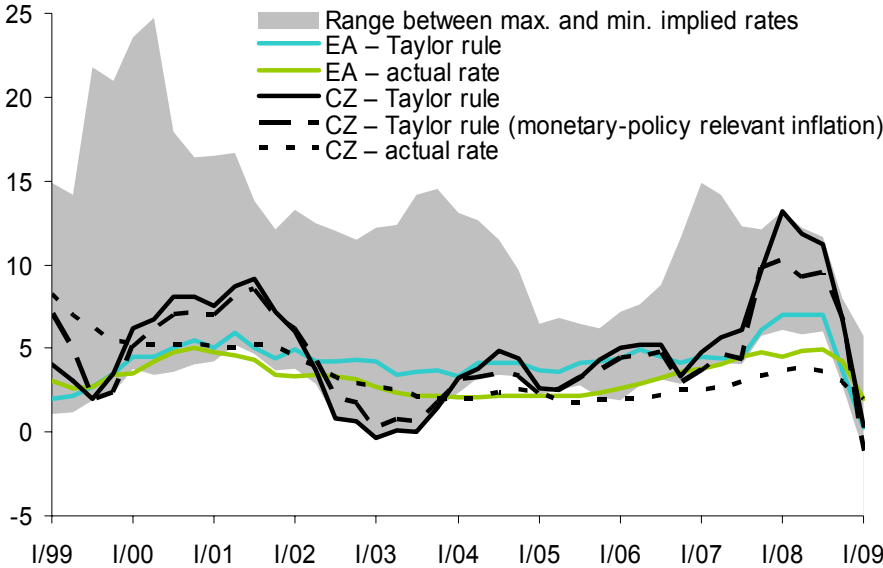
²⁵ The only exception is a statistically insignificant positive value in the first period calculated under Method 2.

²⁶ The Taylor rule (Taylor, 1993) is a simple but relatively robust form of the central bank's reaction function. It is a backward-looking rule which can be interpreted as a statistic of the current cyclical position of the economy. However, it is not able to abstract sufficiently from temporary and non-cyclical shocks and to capture the forward-looking nature of monetary policy.

²⁷ For details, see the *Methodological Part*.

Chart 5 illustrates the overall evolution of the implied monetary policy rates in all the economies under review. The grey area shows the range between the maximum and minimum implied rates for the individual countries under review in the given period. In addition, the implied rates for the Czech Republic and the euro area and the actual CNB and ECB rate settings are illustrated. The trend of a narrowing spread between the maximum and minimum implied rates (a narrowing grey range) can be interpreted as being a consequence of the stabilisation of the transforming economies, for which the Taylor rule prescribed higher rates at the start of the period under review. Stabilisation of the spread at around 6 percentage points can be observed starting in 2007 Q4.²⁸ The systematic difference between the implied rates and the actual rates is a logical reflection of the limitations of the chosen method and its purpose, namely to observe the business cycles of the individual economies, not to estimate the optimum real rate settings.²⁹

Chart 5: Actual and implied monetary policy rates



Note: The grey area marks the range between the maximum and minimum implied rates for all the countries under comparison in the given period.

Sources: Eurostat, CNB calculations.

For most of the period under review, the estimate of the implied rates for the Czech economy is relatively close to the rate implied for the euro area and in the lower half of the grey area, even forming its lower boundary during 2002 Q1–2003 Q4. More pronounced deviations from the implied rate for the euro area occurred in 2000–2001, 2002 Q3–2003 Q3 and 2007 Q4–2008 Q3. The first of these periods saw a domestic economic recovery replacing the previous recession, amid a concurrent weakening of the previously relatively robust economic growth in the euro area. In 2002 Q3–2003 Q3, the Czech Republic experienced a significant fall in inflation following a strong appreciation of the exchange rate. In the last of the three periods of more pronounced deviations, a fluctuation in the Czech implied rates in the opposite direction was recorded, up to the upper boundary of the range. This can be explained

²⁸ The evolution of the implied rates of the euro area members under review does not indicate a diverging trend and so does not support the specialisation hypothesis (Krugman, 1993).

²⁹ To a certain extent, however, the above difference may also reflect excessively easy monetary policy conditions around the world before the current financial and economic crisis broke out.

partly cyclically and partly by substantially higher domestic inflation resulting from growth in regulated prices and other administrative measures in the Czech Republic, which had mostly one-off impacts, in a situation of rising world prices of raw materials. The Czech National Bank in reality set interest rates much lower in the given period. This was due to the forward-looking nature of monetary policy, which assessed the rise in inflation as temporary and therefore did not need to raise interest rates dramatically.³⁰

The average square of the difference between the implied interest rate of a specific country and the implied rate for the entire euro area can be a measure of cyclical deviation (see Table 8). Although the average of the squares of the deviations in the group of countries compared has been gradually decreasing (except in the recent period), a substantial difference still exists between the more aligned old euro area countries (Germany, Portugal and Austria) and the less aligned new countries (Slovakia and Slovenia) and candidate countries, including the Czech Republic. In 1999–2007, the average square in the Czech Republic was relatively stable and was initially one of the lower ones among the new member countries. However, in 2007 Q1–2009 Q1, the deviation increased owing to faster economic growth and inflation shocks recorded particularly in 2008. In this period, the deviation also increased in some of the other new member countries under comparison. Slightly greater alignment of the Czech economy with the euro area until 2007 is indicated by the implied rate deviations calculated on the basis of monetary-policy relevant inflation,³¹ which are substantially smaller than those calculated using headline inflation for all the intervals under review. The deviation statistics for the euro area support the reported divergence of rates implied by the Taylor rule from actual rates.

Table 8: Average squares of deviations from implied euro area rates

	from 1999 Q1	from 2001 Q1	from 2003 Q1	from 2005 Q1	from 2007 Q1
CZ	6.2	6.8	6.4	6.5	11.7
CZ (monetary-policy relevant inflation)	4.3	3.9	3.6	3.0	5.1
AT	0.5	0.6	0.6	0.2	0.1
DE	0.9	0.8	0.8	0.4	0.2
PT	2.8	2.7	1.0	0.7	0.7
HU	57.6	36.0	29.8	27.3	40.3
PL	29.6	6.6	4.8	4.1	5.0
SI	35.9	24.9	10.3	7.3	13.5
SK	64.5	25.6	27.0	3.5	3.1
CZ (actual rate)	4.8	3.6	4.5	5.5	6.0
EA (actual rate)	1.8	2.2	2.6	2.5	2.3

Note: Periods always ending with 2009 Q1

Sources: Eurostat, CNB calculations.

1.1.4 Synchronisation of economic shocks

In the optimum currency area literature, similarity of economic shocks is viewed as another precondition for an appropriate monetary policy effect in a monetary union (e.g. Frankel and Rose, 1998). However, there is no consensus on the effect of demand and supply shocks. While insufficient symmetry of demand shocks is a general argument against joining a single

³⁰ The backward-looking rule Taylor applied is not able to differentiate between long-term changes in inflation, to which central banks usually respond, and temporary changes, to which central banks mostly do not respond. When analysing the interest rates implied by the Taylor rule, it is important to focus on the medium term and not to assess the appropriateness of the implied monetary policy rates at any given moment.

³¹ Monetary-policy relevant inflation is inflation to which monetary policy responds. It is defined as headline inflation adjusted for the first-round impacts of changes to indirect taxes.

currency area, the literature does not provide a unanimous opinion on the need for the symmetry of supply shocks.

The following analysis identifies the degree of synchronisation of economic shocks between the countries under review and the euro area. According to the method applied, economic shocks are divided into demand shocks, i.e. shocks, with a short-term effect on GDP growth accompanied by co-movement of inflation, and supply shocks, i.e. shocks with a long-term effect on GDP growth accompanied by opposite movement of inflation.³² The analysis draws on quarterly data for 1996 Q1–2009 Q1. To compare the synchronisation of economic shocks over time, the periods 1996–2001 and 2002–2009 are also assessed separately. The correlation of the shocks can take values within the range of [-1;1]. High positive values indicate that the shocks are symmetric with respect to the euro area. Low or negative values correspond to asymmetric shocks. When interpreting the results, one should keep in mind the possible distorting effect of the excessive exchange rate volatility recorded in some periods on the correlation of demand and supply shocks. Euro area entry would eliminate this volatility.

The resulting **demand shock correlations** are shown in Table 9. The measured correlation of the demand shocks identified for the Czech Republic in relation to the euro area is close to zero, or at statistically insignificant negative levels, both for the overall period 1996–2009 and for the two sub-periods. This implies that the (non-)synchronisation of this type of shock has not changed so far. Nevertheless, a comparison of the results of the analysis indicates that the risk due to demand shock asymmetry is not much higher for the Czech economy than for the other countries under review, since their correlations are not statistically significant either. The only exception is the relatively high and statistically significant correlations of Germany, which, however, are not surprising given the significant share of German GDP in euro area GDP.

As regards **supply shocks** (see Table 10), the correlation for the period 2002–2009 is positive for all countries and, with the exception of Poland, the coefficients are statistically significant. The economic downturn due to the ongoing crisis is interpreted by the model as a common supply shock as a result of its longer-lasting effect. In contrast to the previous period, there have thus been shifts towards higher and statistically significant symmetry of supply shocks with the euro area. Only in the case of Poland did the correlation coefficient increase, but it is not statistically significant. The correlation coefficients for the entire period are positive and statistically significant for Germany, Slovenia, Slovakia, Hungary and Austria. The measured correlation of the Czech Republic with the euro area has changed from a statistically significant negative value of -0.53 for 1996–2001 to a positive value of 0.33 differing from zero at the 10% significance level for the period 2002–2009. The slightly positive correlation for the overall period, however, remains statistically insignificant. For the last period, the symmetry of supply-side shocks in the Czech Republic is at a comparable level as in Austria, but lower than in the other current euro area members.

³² This method identifies economic shocks using econometric methods and does not ascribe specific structural interpretations to them, for example their source or form. The estimated shocks do not necessarily correspond to the traditional concept of demand and supply shocks. Since we work with real data of limited length, a demand shock that has a temporary effect on GDP growth (e.g. the recently observed decline in economic activity) may be identified by the model as a supply shock. In the literature, such structural shocks are alternatively described respectively as shocks that do not have a lasting effect on GDP and shocks that do have a lasting effect on GDP.

Table 9: Correlation of economic shocks vis-à-vis the euro area – demand shocks

	1996–2009	1996–2001	2002–2009
CZ	-0.06	0.06	-0.12
AT	0.03	-0.08	0.18
DE	0.46 ***	0.49 **	0.44 ***
PT	0.14	0.15	0.08
HU	-0.01	0.05	0.00
PL	-0.05	0.05	-0.06
SI	-0.05	0.10	-0.11
SK	-0.08	-0.21	0.26

Note: The significance of the correlation coefficient is marked ***, ** and * for the 1%, 5% and 10% significance levels respectively.

Sources: Eurostat, CNB calculations.

Table 10: Correlation of economic shocks vis-à-vis the euro area – supply shocks

	1996–2009	1996–2001	2002–2009
CZ	0.09	-0.53 **	0.33 *
AT	0.23 *	-0.16	0.31 *
DE	0.61 ***	0.46 **	0.72 ***
PT	0.19	-0.21	0.49 ***
HU	0.25 *	-0.17	0.46 **
PL	0.15	0.13	0.21
SI	0.52 ***	0.31	0.60 ***
SK	0.28 **	-0.31	0.53 ***

Note: The significance of the correlation coefficient is marked ***, ** and * for the 1%, 5% and 10% significance levels respectively.

Sources: Eurostat, CNB calculations.

1.1.5 Macroeconomic effects of financial flows from EU funds

The Czech Republic has been a recipient of financial flows from European funds for more than five years now. Prior to EU entry it drew relatively low volumes of financial aid under the “pre-accession instruments”.³³ However, following EU entry the volume of funds available to the Czech Republic from the European budget (the “allocation”) was increased significantly. Inflows of EU funds represent a potential economic stimulus, especially in the area of investment activity.³⁴

The financial flows between the Czech Republic and the EU have so far been relatively slow. The net balance of the Czech Republic vis-à-vis the EU³⁵ recorded a significant increase

³³ PHARE, ISPA and SAPARD.

³⁴ The analysis does not expect private investment to be crowded out by public sector investment. The investment activity connected with the implementation of EU projects is financed largely from EU funds. Therefore, it does not directly imply any demand for higher public budget expenditure/deficits and additional government bond issues and the associated upward pressure on interest rates with a negative impact on private investment. The share of national cofinancing of EU projects should be ensured as much as possible by re-directing funds from national economic and social cohesion projects to EU projects. This will reduce the crowding out of private investment and also decrease demand for general government expenditure. Cofinancing of EU projects from public sources is classified as national expenditure, which simultaneously aids compliance with the additionality principle.

³⁵ The net balance is defined as the difference between the country’s total income from EU funds and its contributions to the EU.

between 2005 and 2008, peaking at CZK 21.6 billion in 2008 (see Table 12), but this was due to the receipt of advance payments from the Structural Funds (SF) and the Cohesion Fund (CF) and for rural development in the new programming period 2007–2013. Excluding advance payments from the net balance and, conversely, taking into account the actual drawdown from the SF and CF, the net balance of the Czech Republic vis-à-vis the EU in 2007–2008 would be significantly lower and would mainly reflect the slow drawdown of funds for economic and social cohesion projects from the allocation for the new programme period (see Table 11). The drawing of SF and CF under the new programme period (2007–2013) fell well behind schedule owing to the Czech authorities' slow progress in preparing and approving strategic documents (e.g. operational programmes) for economic and social cohesion projects. The data on the use of SF sources for 2009 H1, however, indicate that the teething problems with drawing funds from the 2007–2013 allocation have probably been overcome, so a significant acceleration in drawdown for structural operations can be expected starting this year.

Table 11: Drawdown of financing from EU Structural Funds in the Czech Republic (realised expenditure and submitted payment requests, CZK millions)

	2005	2006	2007			2008			2009
			H1	H2	Total	H1	H2	Total	H1
2004–2006 allocation^{a)}	2086	13162	6130	8928	15058	5453	5069	10522	1836
2007–2013 allocation^{b)}	-	-	-	-	-	104	2181	2284	13607
Total	2086	13162	6130	8928	15058	5557	7250	12807	15443

Notes: ^{a)} Realised expenditure financed from 2004–2006 allocation within operational programmes (Objective 1: Supporting Development in the Less Prosperous Regions) and single programming documents (Objective 2: Revitalising Areas Facing Structural Difficulties; Objective 3: Supporting Education, Training and Employment Policies); EU funds only.

^{b)} Submitted applications for payments from 2007–2013 allocation within operational programmes (Objective 1: Convergence; Objective 2: Regional Competitiveness and Employment); EU and national resources. Does not include funds spent within Objective 3 (European Territorial Cooperation), since only the Poland-Czech Republic Cross-Border Operational Programme is the responsibility of the Czech managing authority.

Source: Ministry for Regional Development.

A strong increase in the inflow of funds for structural operations is expected in 2010, when, according to Ministry of Finance estimates, the net balance of the Czech Republic vis-à-vis the EU should jump to 1.5% of GDP. It should continue rising in subsequent years to more than 2% of GDP in 2013³⁶ (see Table 12).

Some financial flows between the Czech Republic and the EU affect the government sector balance. In the past, their effect on the government balance was negative, at 0.2%–0.3% of GDP, and a similar outcome is expected in 2009. The situation should change in 2010 as the positive effect of the inflow of funds for agriculture and structural operations outweighs the very slowly rising transfers of own resources. However, the need for national cofinancing of structural operations and rural development could pose a risk to the government sector balance.

³⁶ The current estimates of the net balances for 2010–2013 have been increased by 0.4–0.6 percentage points compared to last year's estimates, both because of the need to draw on still unused allocations from previous years and owing to the weaker exchange rate of the koruna against the euro leading to a relative increase in the koruna value of the allocations, which are expressed primarily in euro.

Table 12: Expected financial flows resulting from the Czech Republic's EU membership and estimated impacts of drawdown of EU funds by the private sector on the economy (CZK billions)

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Pre-accession instruments	2.1	2.6	0.5	0.6	-	-	-	-	-
Agriculture	11.8	14.3	17.6	14.6	24.1	24.6	26.3	27.9	35.9
Structural operations	6.3	13.3	27.6	41.9	39.3	70.7	86.8	87.0	92.6
Internal policies	1.8	1.6	1.6	1.2	1.4	1.3	1.3	1.2	1.2
Compensation	8.9	5.7	-	-	-	-	-	-	-
EEA/Norway financial instrument	-	0.1	0.1	0.5	1.1	0.8	0.3	0.3	0.5
Total income from EU	31.0	37.5	47.4	58.7	65.9	97.3	114.6	116.4	130.2
Own resources	28.6	30.3	32.1	35.4	42.1	41.5	40.8	42.0	41.7
Payments to EIB, RFCS, etc.	0.8	1.0	1.8	1.7	1.1	0.0	0.4	0.5	0.4
Total payments to EU	29.4	31.3	33.9	37.1	43.2	41.5	41.2	42.5	42.2
Net balance	1.6	6.2	13.5	21.6	22.6	55.9	73.4	73.9	88.0
Net balance in % of GDP	0.05	0.19	0.38	0.58	0.62	1.51	1.92	1.85	2.10
Impulse in p.p. of GDP	0.08	0.16	0.01	-0.05	0.30	0.16	0.16	-0.03	0.15

Note: 2005–2008 data = actual values

Sources: Czech Ministry of Finance (preliminary estimates in EUR) and CNB calculations.

The potentially sizeable increase in financial inflows from EU funds will imply an additional stimulus for the Czech economic activity. The magnitude of this stimulus will depend on the actual use of these funds by final recipients. The expected additional economic impulse is based on an expert estimate of the real drawdown of funds from the EU by the private sector. The numerical expression of this impulse in the form of its contribution to growth is based on the fiscal impulse calculation method within the CNB's macroeconomic model (see the *Methodological Part* for details).

According to the current estimate, the additional impulse from the inflow of money from EU funds is likely to peak this year. A slightly positive effect on Czech GDP growth can also be expected in 2010–2011 and 2013 (see Table 12, last row). The values of these impulses in these years are approximately twice as high as in last year's estimates. Nevertheless, they are still relatively low and hence do not imply any risk of a significant asymmetric shock arising from the drawing of financial assistance from the EU over the horizon under review.

The simulation of the macroeconomic effects of EU fund inflows takes account in particular of the short-term and medium-term impacts of the use of this money; the potential impacts on the supply side of the economy are expected more in the long run and are not modelled. It is also assumed that the drawdown of EU funding is generally expected and will not affect the exchange rate in terms of conversion of EUR into CZK. Table 13 shows the simulation results of the demand shock due to the drawdown of EU money. The values given represent the deviations of the inflation path, output gap, CZK/EUR exchange rate and interest rates from the macroeconomic scenario that does not take into account the drawdown of money from EU funds.

Table 13: Impact of the additional impulse due to the inflow of funds from the EU (deviations from equilibrium)

		2009	2010	2011	2012	2013
Inflation	(p.p.)	0.02	0.04	0.00	0.01	0.00
3M PRIBOR	(p.p.)	0.09	0.08	0.05	-0.03	0.02
Output gap	(p.p.)	0.18	0.16	0.03	-0.12	-0.04
CZK/EUR	(CZK)	-0.06	-0.14	-0.13	-0.06	-0.03

Source: CNB calculations.

The simulation results show that the impact of the inflow of funds from the EU will have a relatively modest effect on the variables under review in 2009–2013. The strongest effect can be expected for economic growth in 2009–2010, when faster drawdown of EU funds will lead to an increase in real GDP of around 0.2%. Inflation will deviate only negligibly from the baseline scenario. An only slight impact can also be expected for interest rates (less than 0.1 percentage point) and the exchange rate. The generally higher values of the additional impulse due to the inflow of money from EU funds compared to last year's estimates lead also to higher deviations of the monitored variables from the baseline scenario. Given their relatively low values, however, the conclusion of last year's analysis that the impact on the koruna's participation in the ERM II system and the fulfilment of the convergence criteria is insignificant can be confirmed. The results of the simulation should, however, be taken as tentative and conditional on the methodology used.

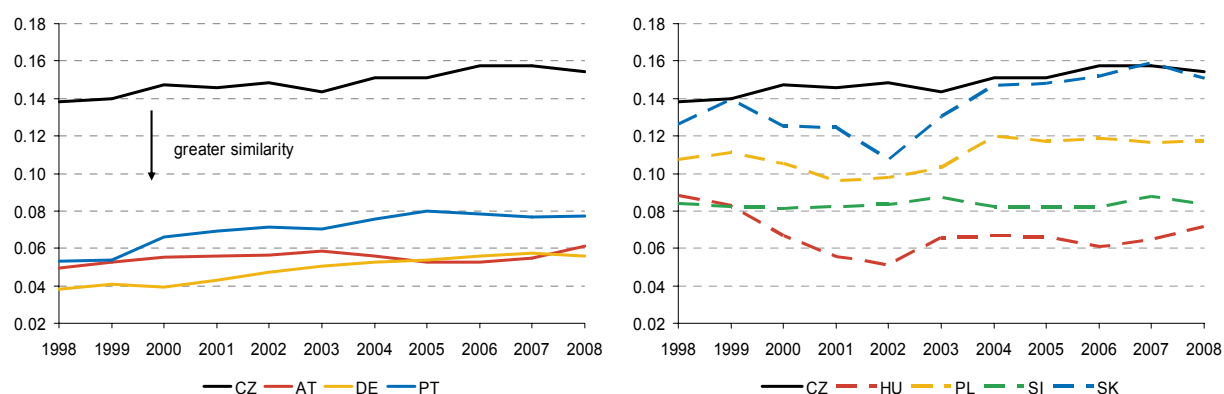
1.1.6 Structural similarity of the economies

Greater similarity of the structure of economic activity between the acceding economy and the other economies of the monetary union decreases the risk of occurrence of an asymmetric economic shock. The structural similarity of the economies of the countries under comparison with the euro area is measured using the Landesmann structural coefficient, which compares the shares of six sectors of the economy in total value added in the countries under comparison and the euro area. The coefficient takes values in the range of [0;1]. The closer the coefficient is to zero, the more similar is the structure of the economies under comparison. Chart 6 shows that the Landesmann coefficient for the Czech Republic is the highest of all the selected countries over the entire period between 1998 and 2008. The structure of economic activity in the Czech Republic is thus, together with Slovakia, the least similar to the euro area average.³⁷ Despite this, the indices for the Czech Republic and Slovakia are relatively close to the lower boundary of the interval [0;1]. The difference in the structure of value added in the Czech economy consists mainly in a high share for industry³⁸ and in a lower share for services, in particular financial intermediation, real estate and other services (see Table 14).

³⁷ The rise in the Landesmann coefficient in Slovakia and partly also in the Czech Republic in the period 2003–2007 can be explained by an increasing share of value added of industry in total value added in combination with a broadly stable contribution of industry to total value added in the euro area. In 2008, the share of value added of industry (sectors C, D and E) in Slovakia decreased in favour of growth in services (sectors G, H and I).

³⁸ In Czech industry as a whole there is, moreover, a high share for the car industry, which is comparable with Germany and thus higher than the euro area average. In the event of an industry shock, it can thus be assumed that the single monetary policy would not respond to inflationary or anti-inflationary risks in the Czech economy in the same way as an independent monetary policy would probably react. A detailed analysis of product specialisation, among other things with regard to the share of the car industry, can be found in the 2008 *Analyses of the Czech Republic's Current Economic Alignment with the Euro Area* (section 1.4.3 *Product specialisation*, including Box 2, pp. 59–61).

Chart 6: Structural similarity vis-à-vis the euro area



Sources: Eurostat, CNB calculations.

Table 14: Shares of economic sectors in GDP in 2008 (%)

	A, B	C, D, E	F	G, H, I	J, K	L až P
CZ	2	33	6	25	17	17
AT	2	23	7	23	24	20
DE	1	26	4	18	29	22
PT	3	18	6	24	22	26
HU	4	25	5	22	22	22
PL	4	25	7	27	19	18
SI	2	26	8	22	22	19
SK	4	31	8	24	17	16
EA-16	2	20	6	21	28	22

Note: The sectors are broken down according to the NACE classification: A, B – agriculture, forestry and fishing; C, D, E – industry; F – construction; G, H, I – wholesale and retail trade, repair, accommodation, transport and communication; J, K – financial intermediation, real estate, renting and business activities; L–P – other services.

Sources: Eurostat, CNB calculations.

1.1.7 Interest rate convergence

Some countries entering the currency area in the past faced fast nominal interest rate convergence to the union level, which acted as an asymmetric shock.³⁹ Therefore, earlier nominal interest rate convergence is better for smoother accession to the euro area, as it will suppress the additional asymmetric shock associated with euro adoption and sudden elimination of the risk premium.⁴⁰

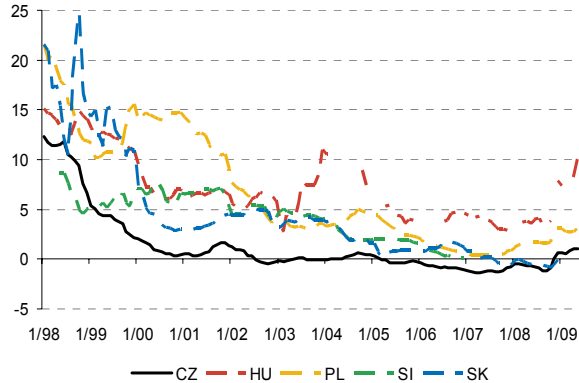
The following comparison of the **nominal interest rate differential** vis-à-vis the euro area attempts to express the probability of the asymmetric shock described above. The closer the nominal interest rate differential is to zero, the smaller is the risk that joining the monetary union will cause a quick change in both nominal and real interest rates, which would have a destabilising effect on the economy. Charts 7 and 8 illustrate the interest rate differentials in

³⁹ Although real economic activity is affected primarily by real interest rates, nominal interest rates may also have a significant effect via some credit or budgetary constraints (e.g. the loan repayment to financial income ratio).

⁴⁰ See also section 1.1.1.

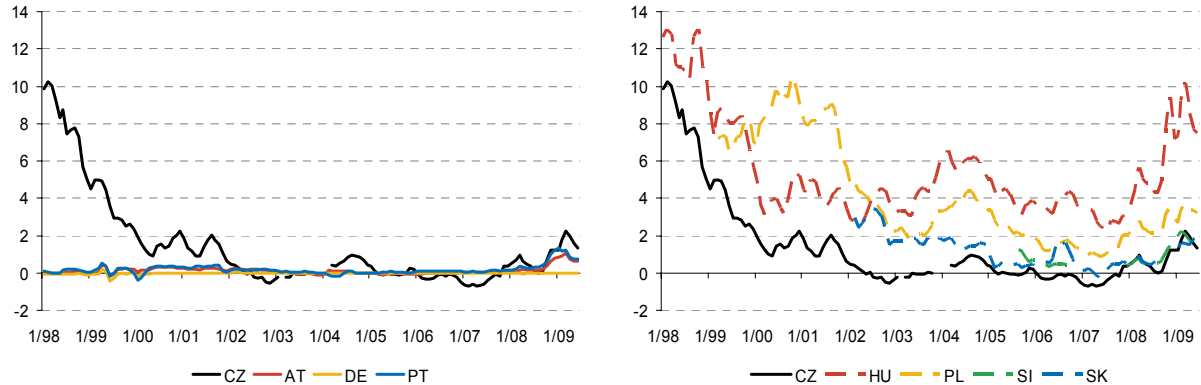
the Czech Republic, Hungary, Poland, Slovenia and Slovakia vis-à-vis the euro area for three-month rates on the interbank market and five-year government bonds.

Chart 7: Differences in three-month interest rates vis-à-vis the euro area (p.p.)



Sources: Eurostat, CNB calculations.

Chart 8: Differences in five-year interest rates vis-à-vis the euro area (p.p.)



Sources: Bloomberg, CNB calculations.

Chart 7 and Chart 8 show that interest rate convergence proceeded more or less continuously for all the countries under comparison and for both maturities until 2008 Q3. However, following the escalation of the global financial crisis in September 2008, the relating worsening of investor sentiment towards some new EU Member States and the marked fall in the ECB’s key rates, interest rate differences vis-à-vis the euro area increased significantly. The biggest increase among the countries under comparison was recorded for Hungary,⁴¹ where the interest rate differential for three-month rates returned to the 2003 level and that for five-year government bonds to the 1999 level.

Interest rate differentials for three-month and five-year rates in the Czech Republic have increased to positive values, but are still relatively close to zero. Similar developments are being observed in Austria, Portugal, Slovenia and Slovakia, i.e. in current euro area countries.⁴² The end of the period under review saw continuing positive interest rate

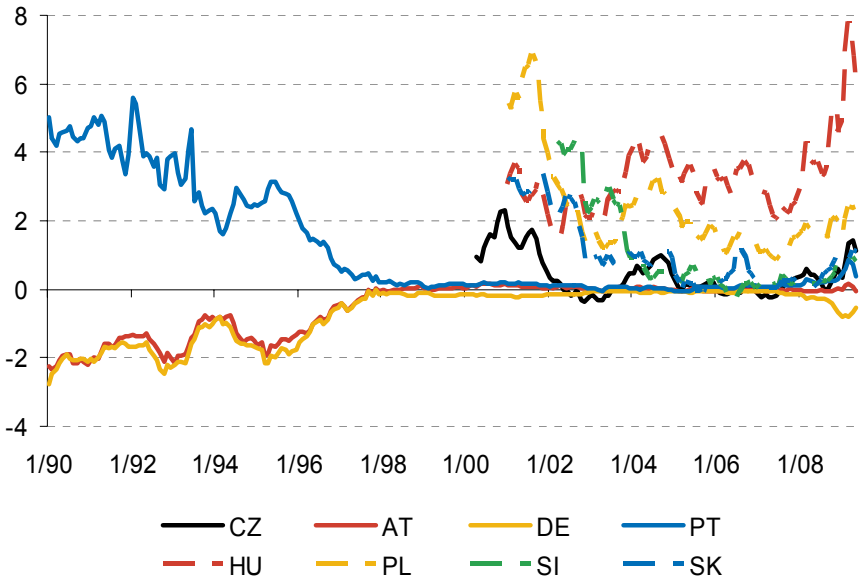
⁴¹ Hungary has long had higher interest rates, but even there rates were gradually falling in the past.

⁴² ECB (2009b) finds a rising spread in government bond yields due to the financial and economic crisis between euro area countries as well. The rise reflects differentiation of markets as regards risk perceptions of the

differentials for short-term rates on the interbank market in the countries with independent monetary policy under comparison. The differences in five-year government bond yields are also positive, but have started to fall slightly again.

A increase in interest rate differentials of similar magnitude to that for five-year government bonds was recorded for ten-year government bonds, where the level compared is defined as a weighted average of yields in euro area countries (see Chart 9). The chart also provides a comparison with the situation in the euro area countries prior to euro adoption.⁴³ The interest rate differential for Czech ten-year government bonds fluctuated very close to zero between 2005 and 2008, but rose somewhat in 2009. The present level of Czech long-term interest rates can be compared roughly to the interest rate differential in Portugal two years before euro adoption. Despite the recent modest rise in long-term rates, the Czech Republic is closest to the euro area average among the non-euro area countries under comparison.⁴⁴ Poland's interest rate differential is somewhat higher than the Czech Republic's. Hungary traditionally shows the biggest difference in long-term rates.

Chart 9: Differences in interest rates vis-à-vis the euro area 1990–2009, long-term interest rates (p.p.)



Sources: Eurostat, CNB calculations.

The evolution of interest rates on the markets of the new EU Member States and the euro area countries reflects the uncertainty regarding future economic developments and the effects of the present fiscal and monetary policy measures. Although a return to the convergence trend can be expected in connection with the Czech Republic's future entry into the euro area, and

individual euro area countries. This indicates that the single currency eliminates exchange rate risk but not country risk arising from fiscal and macroeconomic trends.

⁴³ When comparing the levels and evolution of these interest rate differentials, the fact that the structural characteristics of the economies have changed since the 1990s should be taken into account.

⁴⁴ Holinka (2005) explains the decrease in the differential of five- and ten-year interest rates in the Czech Republic vis-à-vis the euro area in 1999–2004 in terms of expectations of lower short-term rates due to a decrease in inflation expectations and inflation premiums. However, the impact of short-term rate expectations is relatively weak for ten-year interest rates.

although the financial market situation has calmed recently, the period of higher rate levels and volatility may continue for some time yet.

1.1.8 Exchange rate convergence

Similar movement in the exchange rates of two currencies in the long term vis-à-vis a third (reference) currency reflects similarity in the factors which affect those exchange rates. A high **exchange rate correlation** of two currencies vis-à-vis a third currency can thus be an indicator that the two countries can share a single currency (Aguilar and Hördahl, 1998).⁴⁵ The following analysis uses a GARCH model to estimate the correlation between the exchange rates of the Czech koruna, the Hungarian forint, the Polish zloty, the Slovenian tolar and the Slovak koruna and the euro vis-à-vis the US dollar. A high degree of correlation reflects high similarity of exchange rate movements and less intense asymmetric pressures; the exchange rate correlation of currencies in a monetary union would be one.⁴⁶

Chart 10 illustrates the development of the correlation coefficients in the new EU member countries under review. Compared to the other countries under review, the correlation of the Czech koruna vis-à-vis the euro can be assessed as relatively high until mid-2008 (around 0.8–0.9). The only significant exception in this respect since 2000 was a period of strong appreciation in 2001–2002. Since the end of 2006, the correlation has been around 0.8. Only Slovakia recorded similar levels in the period under review. The correlation of the Hungarian forint and the Polish zloty with the euro remained lower. The Slovenian tolar was characterised by periods of high volatility until 2004.⁴⁷

The initial phase of the financial crisis starting in August 2007 had no substantial effect on the currency markets of the countries under comparison. Nonetheless, the volatility of the exchange rate correlation increased as a result of the first major financial market turbulence, the dollar's exchange rate volatility and the appreciation of the region's currencies. A turnaround occurred in the period following the failure of Lehman Brothers on 15 September 2008, which saw a deep fall (of several tens of per cent) in the correlations of the currencies of all the current non-euro area countries. The decrease in the correlations of these currencies with the euro was due to a general increase in volatility on world financial markets. The different exchange rate movements in most countries were thus not due solely to fundamental factors related to particular economies. In 2008 H2 and 2009 Q1, the Czech koruna, the Hungarian forint and the Polish zloty were exposed to significant depreciation

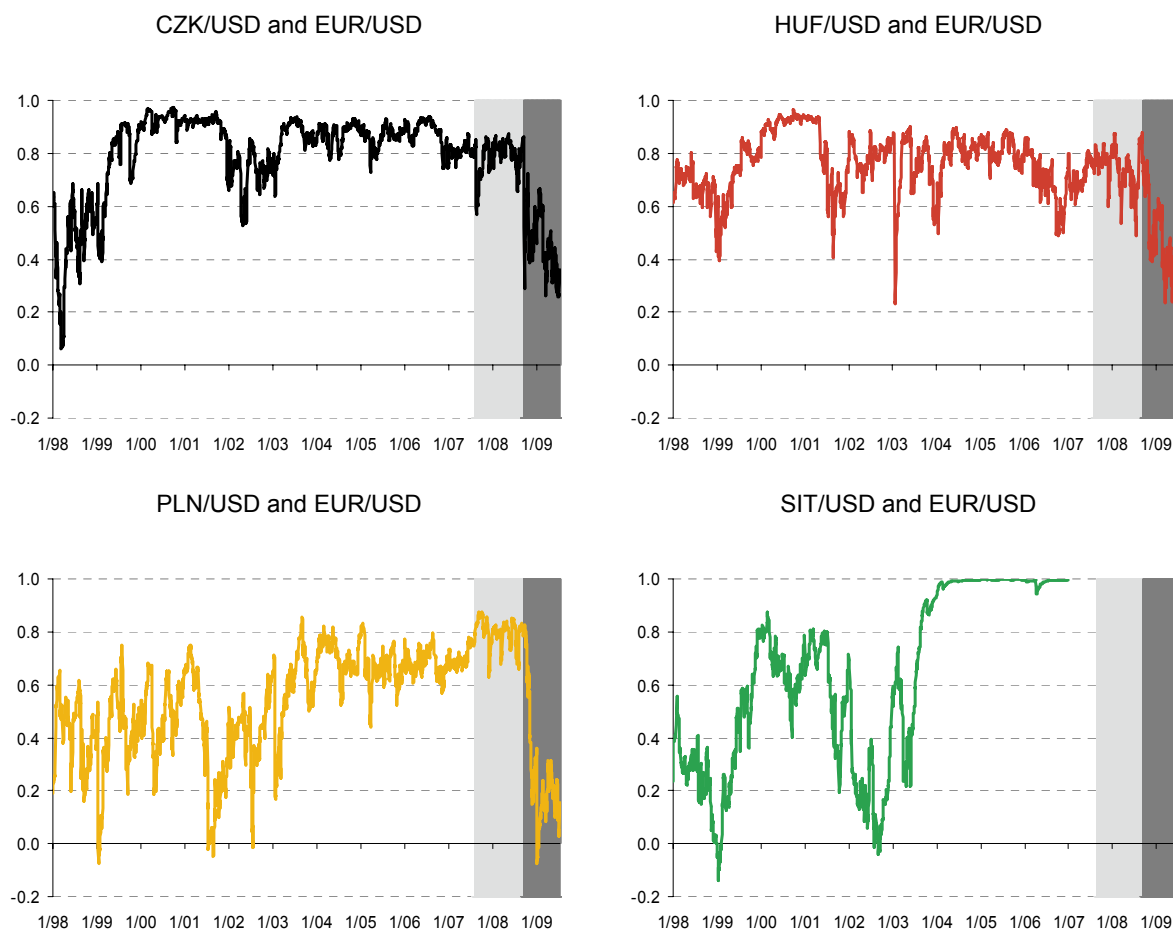
⁴⁵ Aguilar and Hördahl (1998) express the probability of euro adoption in the countries which at that time were EMU candidate countries using the correlation of the exchange rates of their currencies and the Deutsche Mark (as a proxy for the euro) vis-à-vis the US dollar. Babetskaia-Kukharchuk et al. (2008) use the same method to calculate the correlation of four Central European currencies vis-à-vis the euro.

⁴⁶ To assess the importance of exchange rate convergence it would be useful to compare the aforementioned results with the exchange rate correlations of the currencies of Austria and Portugal with the Deutsche Mark before they adopted the euro. However, the direct comparison unfortunately has a limited information value, owing to the different exchange rate regimes in these countries. The Austrian and Portuguese currencies were in essence pegged to the Deutsche Mark as from 1985 (a fixed exchange rate, a crawling peg or a moving band of up to $\pm 2\%$ vis-à-vis the Deutsche Mark; Reinhart and Rogoff, 2004), so the observed correlation should be very close to one, as the data confirm. It can be inferred that this link undoubtedly reduced the costs and benefits of entering the euro area.

⁴⁷ The time series of the tolar-euro correlation under review ends with Slovenia's accession to the euro area on 1 January 2007. Similarly, the time series for Slovakia ends on 1 January 2009.

pressures.⁴⁸ The Slovak koruna avoided this thanks to the Slovakia's planned entry into the euro area on 1 January 2009.⁴⁹ The correlation of the Czech koruna with the euro stayed slightly higher compared to the Hungarian forint and the Polish zloty, but sank to its lowest level since the launch of the euro.

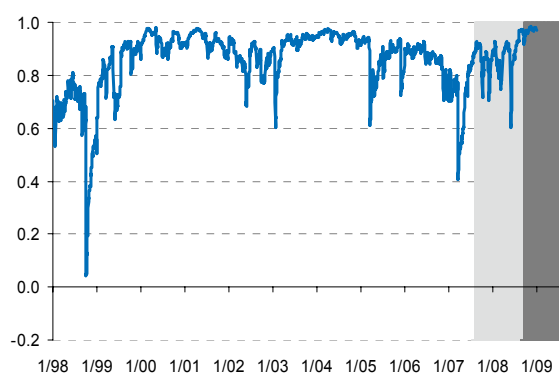
Chart 10: Correlation coefficients of exchange rates against the US dollar



⁴⁸ The Hungarian forint had already been quite strongly affected by the global financial crisis in its first phase. The correlation of the Hungarian forint with the euro grew during 2007 but decreased again when the fluctuation band was abolished in February 2008.

⁴⁹ The effects of the fixing of the Slovak koruna's rate against the euro are discussed in Box 1 in Part B.

SKK/USD and EUR/USD



Note: The light-grey colour of the background marks the first phase of the crisis, the dark-grey colour marks the period following the failure of Lehman Brothers.

Sources: Thomson Datastream, Eurostat, CNB calculations.

To analyse the expected impact of ERM II entry we can draw on the experience of Slovenia and Slovakia. In Slovenia, the national currency's correlation with the euro increased sharply following EU and ERM II accession. Compared to Slovenia, Slovakia had a higher level of correlation before joining ERM II, and so entry itself in November 2005 had no major one-off effect on the subsequent correlation. Moreover, Chart 10 shows that the correlation coefficient for the Slovak koruna is more similar to the correlation coefficient for the Czech Republic in 2003–2008 than that for Slovenia before it entered the euro area. The observed difference in the convergence of the exchange rates of Slovenia and Slovakia during their stay in ERM II chiefly reflects differences in their foreign exchange regimes and the fact that Slovakia continued to pursue inflation targeting after it joined ERM II (see NBS, 2004). The outbreak of the financial crisis also played a role in the relatively high volatility of correlation between the Slovak koruna and the euro. By contrast, the approaching euro changeover date after the central rate had been set helped keep the correlation at high levels.

1.1.9 Analysis of exchange rate volatility

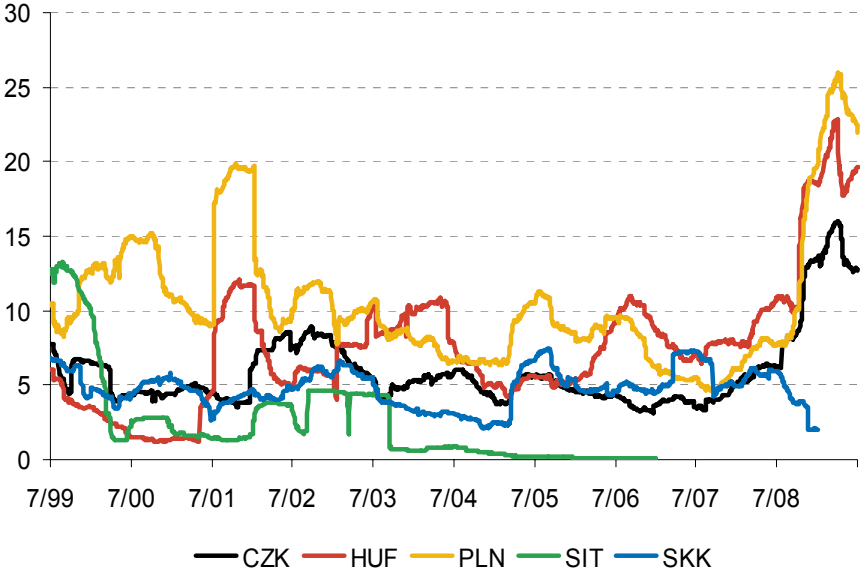
Another way of assessing the risk of occurrence of asymmetric shocks in the Czech economy vis-à-vis the euro area is to analyse the determinants of exchange rate volatility. Low volatility of the exchange rate between two countries may be regarded, in the case of a floating exchange rate regime, as an indicator of their potential to share a single currency (see also section 1.1.8).

Chart 11 describes the historical evolution of the volatility of the exchange rates of the new EU Member States under review vis-à-vis the euro between 1999 and 2009.⁵⁰ The measure of historical volatility is based on the annualised standard deviation of daily returns for the last six months. The chart shows that the lowest volatility was recorded for the Slovenian tolar, whose daily changes were negligible owing to the exchange rate regime applied. The Czech koruna was among the currencies with average to lower volatility in the sample of countries under comparison. However, the volatility of the Czech koruna – like that of the Hungarian forint and the Polish zloty – started rising significantly at the end of 2007, achieving its

⁵⁰ The calculation of the historical volatility uses the standard deviation of returns over a six-month period. This is why the data in the chart start in mid-1999.

highest levels in the period under review from mid-2008 onwards. This reflects the higher uncertainty in global financial markets. The volatility of the Slovak koruna decreased in the same period owing to the adoption of the euro in Slovakia on 1 January 2009. After the Slovak koruna’s conversion rate was fixed in July 2008, the changes in its exchange rate were minimal.

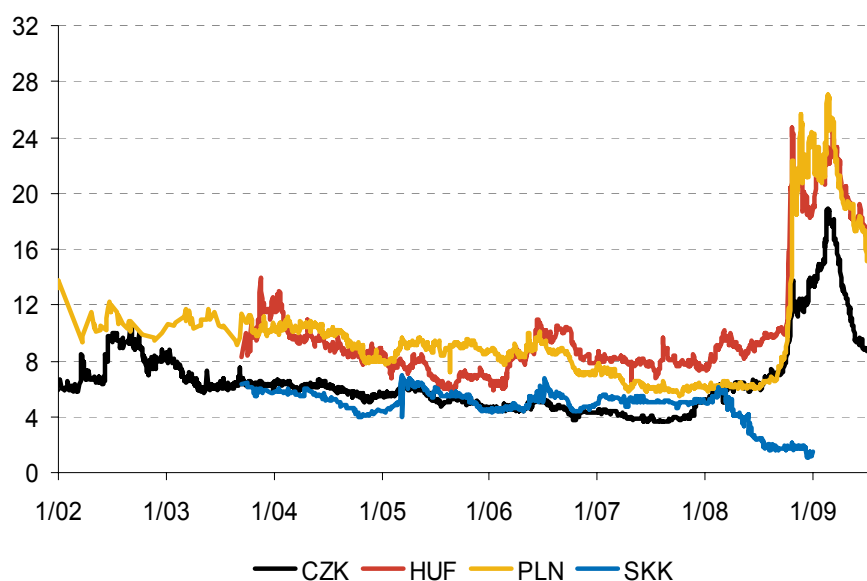
Chart 11: Historical volatility of exchange rates vis-à-vis the euro (%)



Note: Six-month annualised historical volatility of daily returns
 Sources: Datastream, CNB calculations.

An outlook for exchange rate volatility can also be derived from financial markets data. Chart 12 shows movements in the volatility of the exchange rates under comparison which is expected by the financial markets and reflected in the prices of options for the individual currencies (implied volatility). In 2002–2007, the implied volatility had been falling moderately for all currencies and was always lower for the Czech Republic and Slovakia than for Hungary and Poland. The increased uncertainty associated with the financial crisis fostered a sizeable rise in the implied volatility of the Czech, Hungarian and Polish currencies in 2008. By contrast, the implied volatility of the Slovak koruna started to fall significantly owing to the expected adoption of the euro in Slovakia.

Chart 12: Implied volatility of exchange rates vis-à-vis the euro (%)



Source: Bloomberg.

In addition to changes in historical exchange rate volatility or volatility expected by the markets, their determinants can also be monitored and used to compile an indicator of fundamental-based (i.e. theoretically expected) exchange rate volatility. It can be said that the lower the fundamental-based exchange rate volatility, the higher the ability of two countries to share a common currency.⁵¹ This concept of exchange rate volatility is more general and can also be applied to the case where a country does not have a floating rate. For the purposes of comparison with fundamental-based exchange rate volatility, the historical volatility presented here is calculated as an annualised standard deviation of quarterly changes for the whole period under review. The historical volatility of the exchange rate of the Czech koruna in 1999–2008 so defined was comparable with that of the Slovak koruna, slightly lower than that of the Hungarian forint and much lower than that of the Polish zloty. This is consistent with the aforementioned results based on high-frequency data. According to the model used, fundamental-based exchange rate volatility is roughly similar for the Czech Republic, Hungary and Slovenia, slightly lower for Slovakia and higher for Poland. Table 15 provides a comparison of historical and fundamental-based exchange rate volatility for selected currencies vis-à-vis the euro based on data from the period 1999–2008.

Table 15: Historical and fundamental-based volatility of exchange rates vis-à-vis the euro (%)

Exchange rate volatility	CZ	HU	PL	SI	SK
Historical	4.2	6.0	9.1	-	4.2
Fundamental-based	5.8	6.1	6.7	6.1	5.4

Source: CNB calculations.

⁵¹ Horváth (2005) shows that the exchange rate stability of two currencies is greatly affected by the extent to which those countries meet the criteria for optimum currency areas.

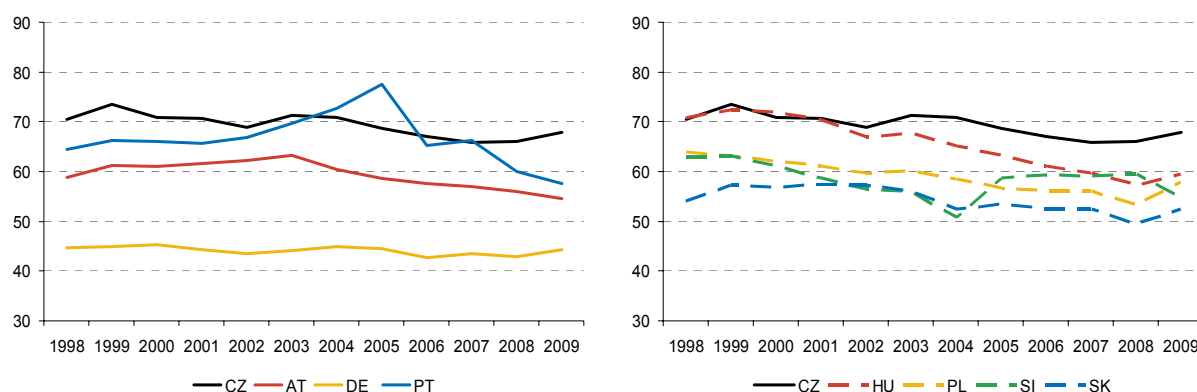
1.2 Effect of international economic relations

The integration of an economy into international economic relations has an influence on the effectiveness of independent monetary policy and the probability of asymmetric economic shocks. Similarity of economic developments of two economies can be fostered both by trade links and by ownership links. An analysis of the openness of the economy is therefore an important part of the analyses of economic alignment.

1.2.1 Integration of the economy with the euro area

Greater economic integration with countries using a single currency, as measured by the share of bilateral foreign trade on both the export and import sides, leads to a lower risk of markedly different economic developments in the observed country with respect to the other countries of the single currency area. Closer trade links thus foster higher correlation of economic activity within a single currency area (Frankel and Rose, 1997).⁵² The intensity of bilateral trade of the countries under review with the euro area is illustrated in Chart 13 and Chart 14. All the countries under review currently have a high degree of economic integration with the euro area. The Czech Republic's bilateral trade with the euro area countries including Slovakia accounts for almost 70% of its total exports and more than 60% of its total imports,⁵³ which is a level comparable to, or even higher than, that of the other countries under comparison.⁵⁴ Thus there exists a relatively wide channel for transmission of economic impulses from the euro area to the Czech economy.

Chart 13: Share of exports to the euro area in total exports (%)



Note: The preliminary value for 2009 was calculated from the 2009 Q1 data.

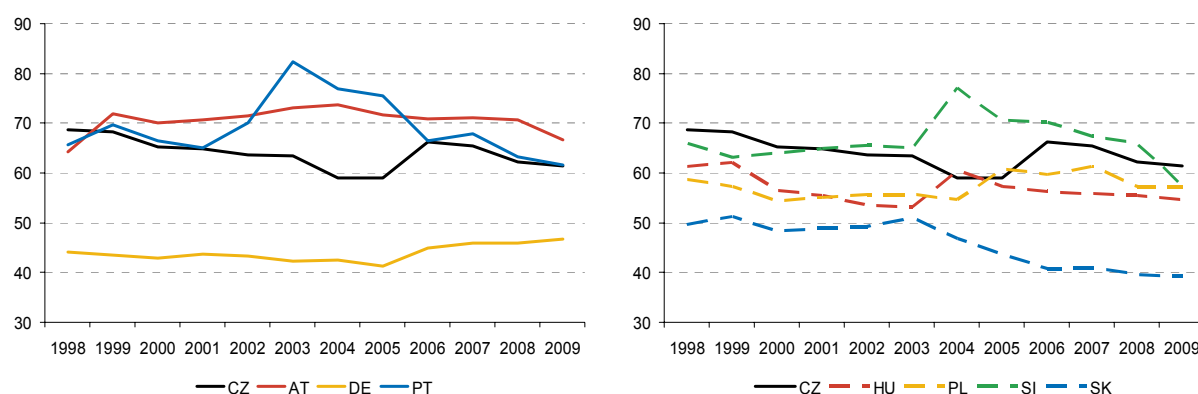
Sources: IMF-DOTS, Eurostat, CNB calculations.

⁵² On the other hand, higher trade intensity may lead to growing specialisation and decreasing structural similarity and thus to less economic symmetry (Krugman, 1993).

⁵³ The main determinants of the dynamics and structure of Czech foreign trade are analysed in Benáček et al. (2005).

⁵⁴ The Czech Republic trades mostly with six EMU countries. According to the 2008 data, the share of Germany in total Czech trade with the euro area was 48%. Slovakia accounted for 12%, Austria for 8% and France, Italy and the Netherlands for about 7% each.

Chart 14: Share of imports from the euro area in total imports (%)



Note: The preliminary value for 2009 was calculated from the 2009 Q1 data.

Sources: IMF-DOTS, Eurostat, CNB calculations.

Like trade links, ownership links foster higher correlation of economic activity. If domestic companies are part of multinational groups, this may help to transmit economic impulses. In addition, capital integration between two countries can help to dampen a negative unilateral demand shock.⁵⁵ Ownership links with the euro area are measured by the share of foreign direct investment (FDI) from the euro area in the surveyed countries in GDP (see Table 16) and by the share of direct investment (DI) from the surveyed country in the euro area in GDP (see Table 17).

Table 16: Share of FDI from the euro area in GDP (%)

	2002	2003	2004	2005	2006	2007
CZ	37.8	35.4	39.0	42.4	44.3	48.0
AT	12.1	12.3	13.6	17.7	22.1	24.3
DE	15.2	15.5	14.6	15.0	16.1	16.3
PT	20.7	19.6	20.3	22.5	27.3	-
HU	29.7	35.7	36.5	37.7	40.4	43.0
PL	16.1	17.7	23.3	23.3	26.0	28.2
SI	11.4	12.2	14.0	14.9	15.9	22.0
SK	16.2	31.4	33.0	37.8	41.9	32.9

Sources: Eurostat, OeNB for Austria, Bundesbank for Germany, MNB for Hungary, CNB calculations.

The Czech Republic's share of foreign direct investment in the euro area in GDP has gradually been rising and, together with Hungary and Slovakia, is the highest among the countries under review.⁵⁶ The ownership links of the other new member countries under review with the euro area has also grown gradually over time, testifying to an increasingly important role played by multinational companies and the external environment in the economies of the countries surveyed.

⁵⁵ A negative demand shock hitting one country may be partly offset by holding diversified investment portfolios. In this way, there may be "private insurance" against potential asymmetric shocks in addition to public transfers between countries (De Grauwe, 2003).

⁵⁶ In 2007, approximately 37% of FDI in the Czech Republic came from the Netherlands, via which non-European companies often invest in Europe. The actual ownership links with the euro area may thus be slightly overestimated. The highest share of direct investment from the Netherlands was recorded in Germany (67%).

Table 17: Shares of DI in the euro area in GDP (%)

	2002	2003	2004	2005	2006	2007
CZ	1.1	1.5	1.7	1.8	2.3	2.3
AT	6.7	7.0	7.3	8.1	11.0	12.3
DE	11.5	11.3	11.0	12.0	13.5	14.8
PT	10.1	10.0	10.9	12.0	13.2	-
HU	1.2	1.5	2.7	3.9	4.2	4.2
PL	0.3	0.4	0.6	0.5	1.7	1.6
SI	1.1	1.3	1.8	1.8	1.9	1.9
SK	0.3	0.2	-0.3	-0.5	0.3	0.7

Sources: Eurostat, OeNB for Austria, Bundesbank for Germany, MNB for Hungary, CNB calculations.

Ownership links in the other direction, i.e. direct investment from the surveyed countries in the euro area as a percentage of their GDP, are so far negligible, particularly in the case of the new EU members (except for Hungary).⁵⁷

1.2.2 Intra-industry trade

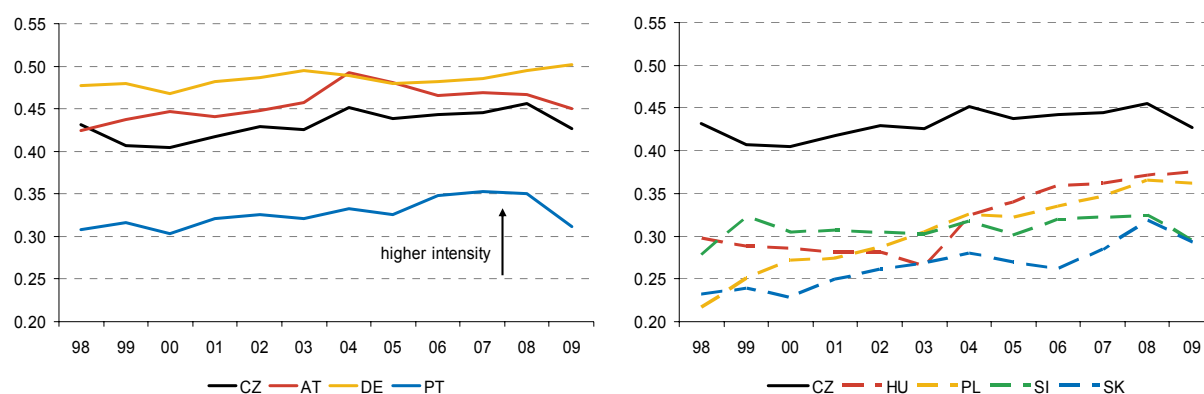
Intra-industry trade is typical of countries with a similar factor structure and is thus one of many indicators of the structural similarity of economies. Intra-industry trade fosters cyclical convergence (Frankel and Rose, 1997) and can also affect the economy's ability to absorb economic shocks.⁵⁸ The theory of intra-industry trade (Krugman, 1981; Hoekman and Djankov, 1996) assumes the greatest intensity of intra-industry trade in capital- and research-intensive industries which can benefit most from economies of scale; as a rule these are industries with high market concentration. The lowest level can be expected in industries associated with particular natural resources.

To analyse intra-industry trade we used the Grubel-Lloyd index, which indicates the share of the absolute amount of intra-industry trade in foreign trade turnover. Chart 15 illustrates the evolution of this indicator in the countries under comparison.

⁵⁷ The stock of Slovak investment in the euro area in 2004 and 2005 was negative owing to a net outflow of other capital, as credit relations were dominated by liabilities of Slovak parent companies to their subsidiaries in the Netherlands.

⁵⁸ Among other things, intra-industry trade growth may have a positive effect on the costs and speed of restructuring, since the transfer of resources may be faster and less expensive if effected within an industry than between industries. A larger proportion of intra-industry trade also acts to refute the specialisation hypothesis based on inter-industry foreign trade.

Chart 15: Intensity of intra-industry trade with the euro area



Note: Compared to last year's version of the analyses the results were calculated on the basis of a more detailed breakdown using the five-digit SITC classification. The level of detail affected the level of the index, but the ranking of the countries under review by the intensity of intra-industry trade remained unchanged (see the *Methodological Part*). The preliminary value for 2009 was calculated from the 2009 Q1 data.

Sources: Eurostat, CNB calculations.

The share of intra-industry trade with the euro area fluctuates slightly over time in all the countries under review, showing a moderate upward trend. The fall in the Grubel-Lloyd index observed at the start of 2009 in most of the countries under review may be linked to the fact that intra-industry trade within the EU was hit harder by the economic and financial crisis than inter-industry trade.⁵⁹ This indicator for the Czech Republic is among the higher among the countries under comparison, i.e. only slightly lower than those for Austria and Germany, but noticeably higher than those for the other countries.⁶⁰ This can be assessed as a positive factor in terms of euro area accession.

Fontagné and Freudenberg (1997) and Fontagné et al. (2006) distinguish between two types of trade: horizontal, i.e. trade in goods of similar quality or degree of processing, and vertical, i.e. trade in goods with significant differences in quality or degree of processing. Horizontal intra-industry trade occurs between countries with a similar economic structure and allows for a wider variety of goods. If, however, the level of economic development of the trading partners differs, intra-industry trade is usually vertical, i.e. trade in goods of very different quality or degree of processing. Thanks to a more detailed data classification, it is possible to calculate the intensity of intra-industry trade for each type of trade (see Table 18). The analysis reveals that horizontal trade is mostly intra-industry trade, with the Grubel-Lloyd index reaching relatively high values in all countries under review.⁶¹ Nonetheless, trade with euro area countries is largely vertical for all the countries under review. The Grubel-Lloyd indices for the Czech Republic are comparable with Germany or Austria.

⁵⁹ The financial and economic crisis has had an adverse effect on trade within the EU, especially in the area of intermediate consumption and capital goods (see ECB, 2009a).

⁶⁰ Our conclusions in this respect are identical to those of Fidrmuc (1999).

⁶¹ The difference between total foreign trade turnover and the sum of horizontal and vertical trade consists of one-way trade and measurement errors.

Table 18: Grubel-Lloyd indices for 2008 by type of trade

	Intensity of intra-industry trade			
	Horizontal		Vertical	
CZ	0.54	(20%)	0.42	(43%)
AT	0.55	(32%)	0.41	(54%)
DE	0.55	(34%)	0.41	(48%)
PT	0.61	(22%)	0.32	(45%)
HU	0.69	(26%)	0.31	(49%)
PL	0.67	(29%)	0.34	(56%)
SI	0.70	(27%)	0.29	(49%)
SK	0.61	(22%)	0.27	(52%)

Note: Numbers in parentheses show the share of the given type of trade in the countries' total trade with the euro area.

Sources: Eurostat, CNB calculations.

1.3 Financial market

From the viewpoint of the optimum currency area theory it is useful to examine how advanced and how similar the financial sectors and capital markets of the countries considering participation in a single currency area are to the markets within that area.⁶² The financial sector and capital market play an important role in the functioning of transmission mechanisms, and at the same time they can be a source of asymmetric shocks. Their structural similarity in those parameters which can be regarded as desirable and their integration into European markets would be a positive signal in terms of euro adoption. In a situation of asymmetric shocks stemming from the financial markets it is necessary to analyse the differences in structure of national banking sectors, taking into account the prudential rules and the risks undertaken, which affect the functionality and stability of the financial sector.

1.3.1 Financial system

A similar level of financial system development and functioning increases the probability that the financial systems in both economies will transmit external economic shocks and monetary policy impulses in the same way. The main characteristics under review are the depth and structure of financial intermediation and in particular – from the point of view of the banking structure – the ratios of loans and deposits, gross and net external debt positions and foreign currency loans.

For several years, the **depth of financial intermediation** in the Czech Republic, as measured by the ratio of financial system assets to GDP, has been approximately one-third of the value for the euro area, Germany and Austria, and 41% compared to Portugal. The ratio of Czech financial system assets to GDP is roughly comparable with that in Hungary and Slovenia and higher than that in Poland and Slovakia (see Table 19). In the Czech Republic, this ratio increase only slightly in 2008 compared to 2007, reflecting a slowdown in financial intermediation as a consequence of the emerging economic recession.

⁶² The advanced state of the financial sector may also be reflected in its high ability to cover exchange rate risks and thereby reduce the costs associated with an independent currency.

Table 19: Financial system assets / GDP (%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008 ^{a)}
CZ	140.1	137.1	133.8	132.5	127.2	133.7	133.4	143.0	145.9
AT^{c)}	332.5	341.2	327.8	344.1	359.3	393.9	408.3	425.7	459.1
DE^{b), c)}	379.2	378.9	378.8	382.7	386.2	398.3	395.5	401.4	397.1
PT^{c)}	329.7	282.6	281.2	307.3	297.6	308.1	327.1	339.8	352.1
HU	79.2	81.0	83.9	93.1	100.0	114.9	128.4	140.5	152.4
PL	65.6	71.0	72.3	76.0	78.7	85.0	96.4	103.1	110.8
SI^{b)}	104.8	113.7	118.5	121.0	128.8	147.3	158.0	172.8	151.9
SK^{d)}	99.2	100.6	102.8	92.9	100.5	110.9	101.5	113.5	117.2
EA^{c), d)}	364.8	348.4	340.6	350.7	366.6	399.2	420.0	441.6	435.3

Notes: Unconsolidated data.

^{a)} Preliminary data.

^{b)} Excluding pension funds (SI until 2001, SK until 2004). DE includes only part of private pension funds.

^{c)} Total assets of credit institutions, insurance companies, pension funds and investment funds.

^{d)} Weighted average. The structure of the euro area total varies according to the number of euro area member countries in each year.

Sources: CNB, national central banks.

The structure of the Czech financial system is similar to that in other euro area countries. The banking sector accounts for 75% of the Czech Republic's total financial system assets, compared to 76% in the euro area. In other countries of the region, this share is similar or even higher (see Table 20).

Table 20: Banking sector assets / financial system assets (%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008 ^{a)}
CZ	81.0	77.5	75.9	74.0	73.6	73.6	73.3	74.2	75.0
AT^{c)}	77.5	77.8	76.6	76.3	76.0	74.9	75.2	77.3	82.4
DE^{b), c)}	78.4	78.3	78.5	77.2	77.1	76.4	77.5	77.8	79.6
PT^{c)}	83.2	81.7	81.5	81.9	80.5	78.4	78.2	79.3	82.5
HU	83.8	82.2	80.7	82.2	81.0	78.4	77.3	76.6	82.2
PL^{c)}	87.7	84.9	79.9	76.4	74.2	70.2	66.7	65.4	73.9
SI^{b)}	71.5	72.9	73.2	73.1	70.7	72.0	72.4	72.8	86.9
SK^{d)}	93.9	93.3	91.8	88.7	87.3	86.0	84.8	79.4	86.2
EA^{c), d)}	74.5	72.0	73.2	72.1	71.7	70.4	70.3	71.9	76.3

Notes: Unconsolidated data.

^{a)} Preliminary data.

^{b)} Excluding pension funds (SI until 2001, SK until 2004). DE includes only part of private pension funds.

^{c)} Total assets of credit institutions, insurance companies, pension funds and investment funds.

^{d)} Weighted average. The structure of the euro area total varies according to the number of euro area member countries in each year.

Sources: CNB, national central banks.

The extent of lending is indicated by the ratio of loans to GDP (see Table 21). This indicator is lower in the Czech Republic than in the euro area countries under review, although the euro area figures do not necessarily represent the optimal level.⁶³ The volume of loans (including loans to general government) in relation to GDP is about two-fifths of that in Germany, Portugal and Austria. Of the selected new EU Member States, Slovenia has the highest ratio of loans to GDP. The rate of growth of bank lending in the Czech Republic was 16% in 2008,

⁶³ This indicator does not capture the risk undertaken (see section 2.5). The euro area indicators may be too high and imply overleveraging, and even the lower ratio for the Czech Republic does not rule out the potential risk of loan default. Total household debt is dealt with in section 1.3.2.

compared to 3% in the euro area. In 2009 H2, however, a significant decrease in lending growth was recorded also in the Czech Republic.

Table 21: Bank loans to non-bank clients / GDP (%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008 ^{a)}
CZ	48.1	41.4	38.5	39.8	39.1	40.4	45.2	52.4	56.8
AT	125.4	124.3	123.6	124.1	127.0	134.0	135.8	139.6	148.4
DE	143.6	144.4	141.0	139.8	136.1	134.7	131.5	129.7	129.6
PT	132.8	131.9	135.3	134.1	135.2	140.3	148.7	158.0	169.3
HU	37.7	35.1	37.3	42.7	48.2	53.3	62.5	64.8	72.7
PL	26.4	29.5	29.1	29.7	32.9	31.9	35.5	43.0	43.8
SI	41.0	39.3	43.2	42.3	51.3	58.8	69.0	84.8	92.8
SK	44.9	34.2	31.9	33.1	33.4	38.0	40.7	44.8	47.0
EA^{b)}	116.1	113.4	112.7	113.6	115.7	122.5	128.1	135.4	136.4

Notes: Unconsolidated data.

^{a)} Preliminary data.

^{b)} Weighted average. The structure of the euro area total varies according to the number of euro area member countries in each year.

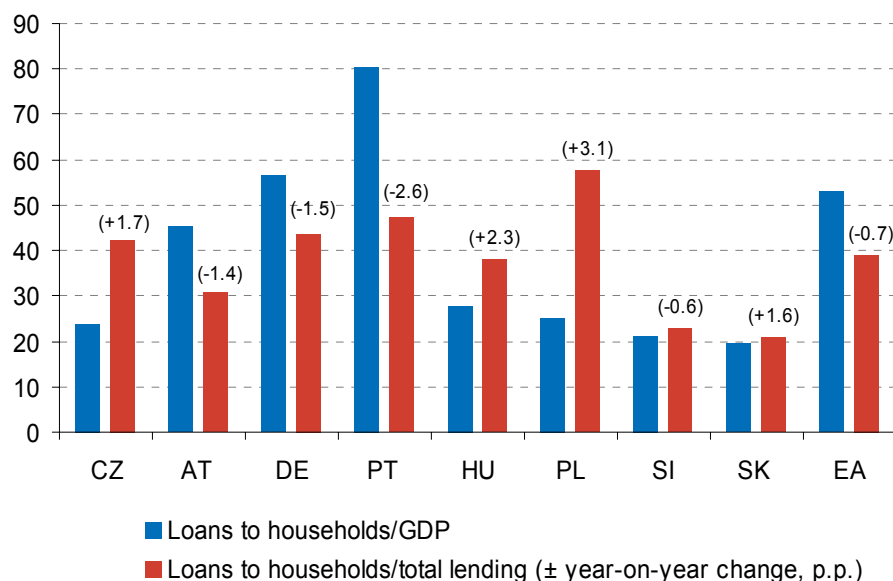
Sources: CNB, national central banks.

From the point of view of the effects on the transmission mechanism and financial sector stability it is necessary to monitor the evolution of **loans to households**.⁶⁴ Their share of GDP in the Czech Republic is much lower than that in the euro area (24% vs 53%; see Chart 16) but in recent years has been quickly approaching to the levels common in the euro area. The rate of growth of household debt in 2002–2008 in the Czech Republic was similar to that in Poland and double that in Austria (see Chart 17). The growth rate of loans to households in the Czech Republic was 30% between 2002 and mid-2008, but decreased to 15% in June 2009. However, this growth is still stronger than in the euro area. The historical experience of some current euro area countries with high growth in household borrowing suggests that such a trend may create considerable risks.⁶⁵ In the Czech Republic, however, the conservative strategy of households borrowing in the domestic currency, which significantly reduces debtors' sensitivity to external developments, has a stabilising effect.

⁶⁴ Loans extended to households by non-banking institutions are not taken into consideration.

⁶⁵ The credit risk associated with a loss of ability to repay loans can be affected by a rise in unemployment or in interest rates on loans as well as by a change in the exchange rate if loans are denominated in foreign currencies. In previous years, households in some countries preferred to borrow from abroad in foreign currency because of higher interest rates on the domestic market (see section 1.3.2). Households were then exposed to multiple risks and market shocks resulting from the financial crisis and economic recession.

Chart 16: Bank loans to households (share in GDP and in total bank lending at the end of 2008, %)

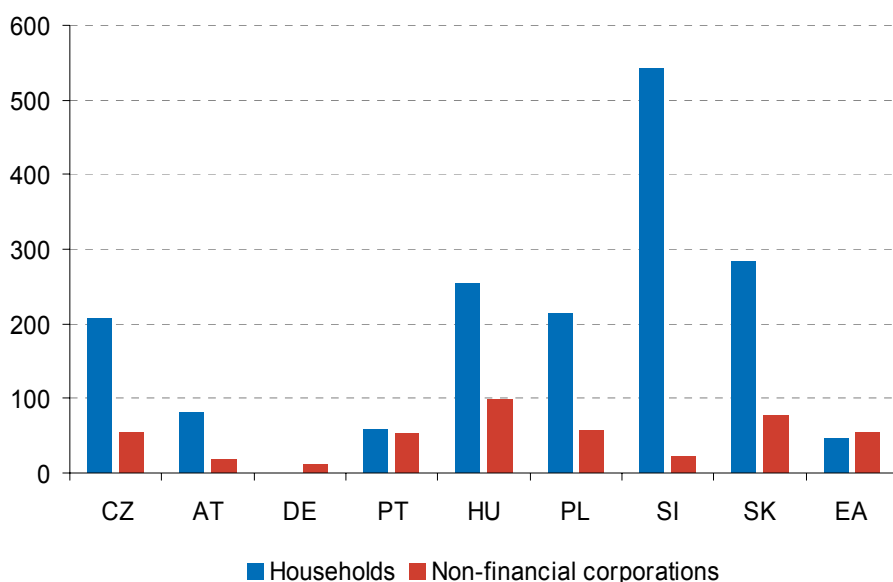


Note: The figure above the column *Loans to households/total lending* expresses the annual change in p.p.

Sources: CNB, ECB, national central banks.

The rate of growth of bank lending to domestic **non-financial corporations** in 2002–2008 was lower than that to the household sector. In this period, loans to corporations increased by 54% in both the Czech Republic and the euro area. Corporate debt in the other new EU Member States generally grew faster than in the euro area (particularly from 2004 onwards) (see Chart 17).

Chart 17: Household and corporate debt growth in 2002–2008 (bank lending growth, %)

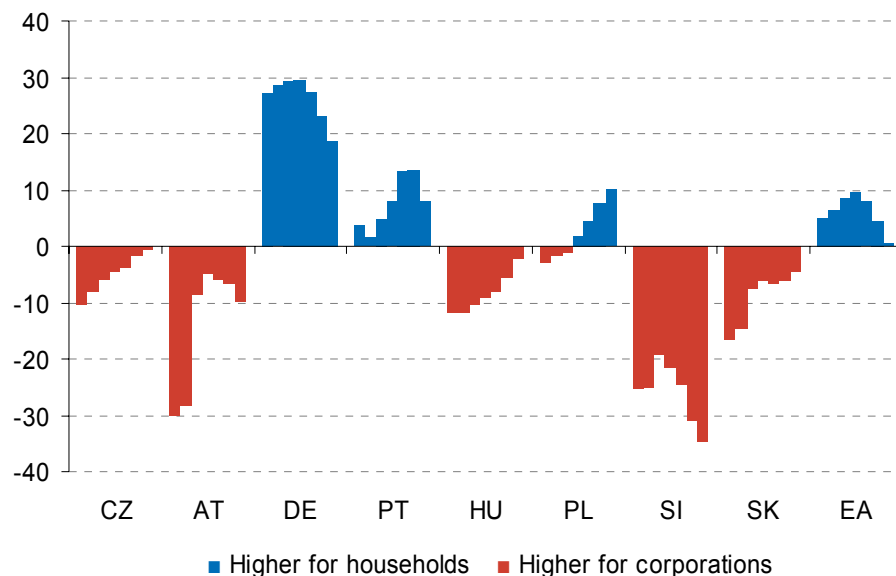


Sources: CNB, ECB, national central banks.

As regards the structure of bank lending, the shares of households and non-financial corporations became much more balanced in 2002–2008. In 2008, the debt-to-GDP ratios of

households and non-financial corporations were roughly the same in the Czech Republic, Hungary, Slovakia and the euro area (see Chart 18). In Germany, Portugal, and partly also in Poland, the debt ratio was higher for households than for corporations.

Chart 18: Differences between household debt as % of GDP and corporate debt as % of GDP (p.p., 2002–2008)



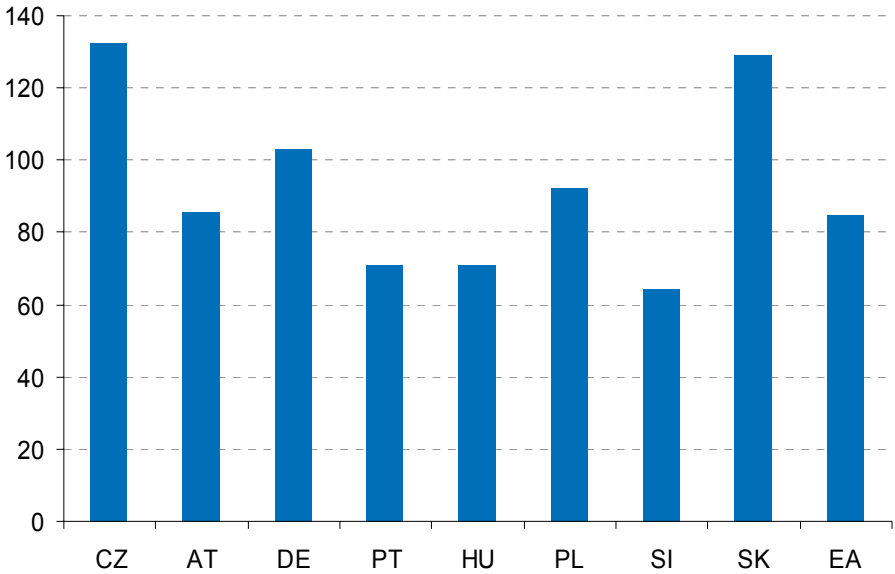
Note: If household debt is higher, the column is blue and above the x-axis; if corporate debt is higher, the column is red and below the x-axis. The structure of the euro area total varies according to the number of euro area member countries in each year.

Sources: CNB, ECB, national central banks.

The Czech banking sector is in a very good capital position in 2009 (see section 2.5). It has favourable balance-sheet liquidity, a high primary client deposit-to-credit ratio, a very low (almost zero in the case of households) proportion of foreign currency loans and considerable independence from external financing (see Chart 19). The independence of the Czech banking sector from external financing is due to its client deposit-to-loan ratio, which is high even by European standards. Banks raise domestic funds either directly or via their own groups from building society and pension fund deposits or from insurance companies in the group. The banking sectors of the Czech Republic, Germany, Austria and Slovenia are relatively independent of external financing. The positive net external position of the Czech banking sector persists despite a high share of foreign ownership of banks.⁶⁶ The major Czech banks are often net creditors of the European bank groups of which they are members. The positive net external position of the banking sector makes it possible to maintain liquidity easily by executing prompt sales of short-term external claims.

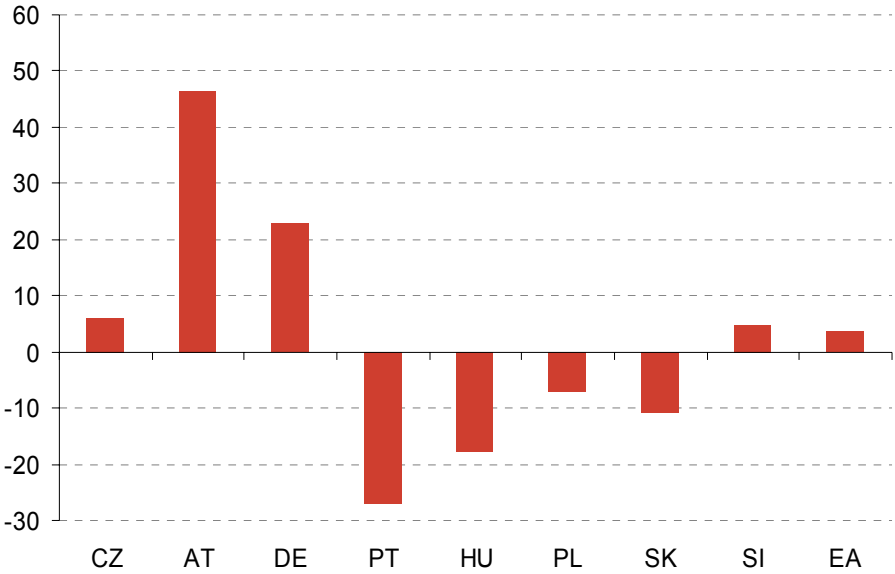
⁶⁶ A total of 96% of bank assets are controlled by foreign capital, with 93% controlled by banks from EU countries.

Chart 19: Primary deposits to loans (% , end-2008)



Note: The indicator in the denominator includes resident loans to non-bank clients.
Sources: ECB, IFS IMF.

Chart 20: External positions of banking sectors (% of GDP, end-2008)



Note: The external positions of the banking sectors are measured by net external assets.
Sources: ECB, IFS IMF.

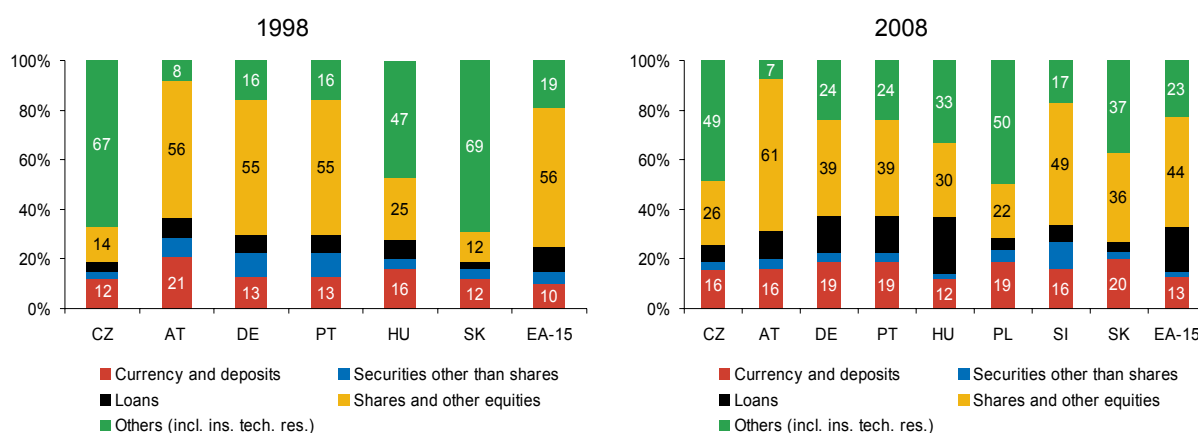
To sum up, the Czech financial system is structurally similar to that of the euro area, despite its smaller depth of financial intermediation. However, the countries under review show some differences in factors relevant to the stability and functioning of the financial/banking sector. The Czech banking sector has strong points which, together with its sufficient capitalisation and profitability (see section 2.5), allow banks and the entire financial sector to operate in a standard manner and, assuming that the temporary frictions on the interbank market subside, to ensure that monetary policy transmission occurs even at a time of recession.

1.3.2 Structure of financial assets and liabilities of corporations and households

Some degree of structural similarity of the financial assets and liabilities of economic agents, which play an important role in the monetary transmission mechanism, is necessary for the single monetary policy to have a symmetric effect.

Between 1998 and 2008, the structure of **financial assets of non-financial corporations** in the Czech Republic gradually converged towards that in the euro area, although some differences still persist.⁶⁷ In the Czech Republic, other assets (including trade receivables) account for the largest share (see Chart 21). Their share has been gradually falling since 1998, but is still well above the euro area level.⁶⁸ The share of currency and deposits in the financial assets of Czech corporations is somewhat higher than in the euro area. By contrast, Czech corporations have a lower share of holdings in the equity of other corporations. The Central European countries (i.e. Hungary, Poland and Slovakia) have a similar structure as the Czech Republic. In 2008, most of the countries under review saw a decrease in the share of equities owing to the global fall in stock market prices.

Chart 21: Financial assets of non-financial corporations



Note: Data for 1998 are available only for the Czech Republic and Slovakia; for the other countries the 1999 data were used (data for Slovenia are not available even for 1999).

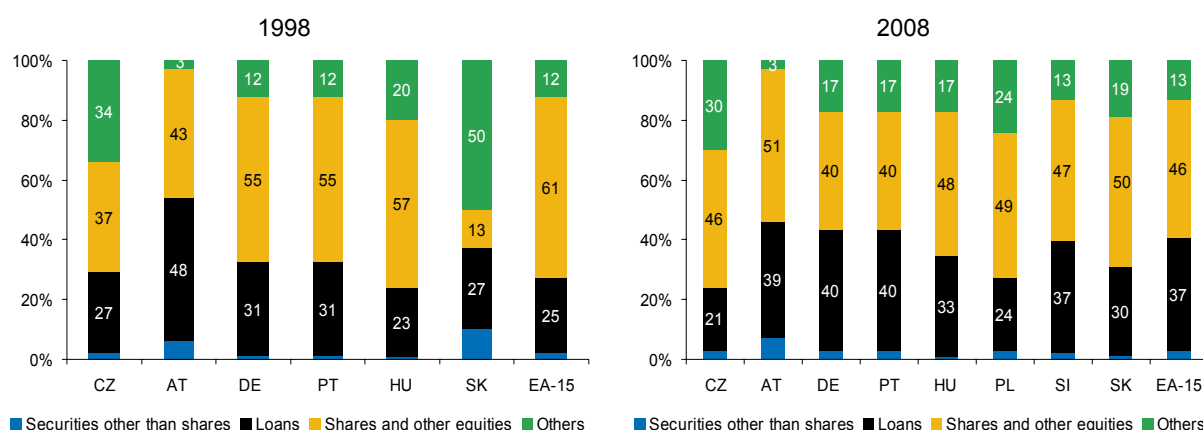
Sources: ECB, national central banks, CNB calculations.

The structure of **financial liabilities of Czech non-financial corporations** also converged to the euro area in 1998–2008. In the Czech Republic, as in the euro area and in the other countries under review, shares issued to finance corporations from their own funds account for half of these liabilities (see Chart 22). As regards external resources, the share of trade credits and other accounts payable within other liabilities is still higher in the Czech Republic than in the other countries monitored. Poland, and to a lesser extent also Slovakia, have similar shares of other liabilities. By contrast, the share of financial loans drawn by Czech corporations is lower than in the euro area. In 2008, all the countries under review recorded a decrease in shares and other equity and a rise in all other components. The convergence of Czech corporations to the euro area between 1998 and 2008 was thus chiefly due to a decline in the share of other liabilities and a rise in the share of equity before 2008.

⁶⁷ At the time of preparation of the 2009 Alignment Analyses, only data for the EA-15 were available.

⁶⁸ The share of other accounts receivable and payable is a residual in the statistics used and may thus be affected by non-economic influences.

Chart 22: Financial liabilities of non-financial corporations



Note: Data for 1998 are available only for the Czech Republic and Slovakia; for the other countries the 1999 data were used (data for Slovenia are not available even for 1999).

Sources: ECB, national central banks, CNB calculations.

The **debt of non-financial corporations**, as measured by the ratio of loans and debt securities issued to GDP, increased in 2003–2008 and is currently about 49% (see Table 22). It is still lower than in 1998, however. The debt of Czech corporations continues to be much lower than in the euro area and in the individual countries under review except Slovakia and Poland. In the current economic downturn, this lower debt is an advantage⁶⁹ for Czech corporations, and even in the medium term it is not necessarily an adverse factor as regards euro adoption. It is still uncertain, however, how well corporations will cope with their reduced ability to repay loans and with the restricted access to loans.

Table 22: Debt of non-financial corporations (loans and debt securities, % of GDP)

	1998	2002	2003	2004	2005	2006	2007	2008
CZ	62.9	47.6	42.2	46.2	42.6	43.6	45.2	48.5
AT	68.3	79.2	80.9	78.0	78.4	78.3	80.2	84.4
DE	54.9	67.8	66.9	62.1	61.4	62.5	63.3	70.5
PT	107.3	128.6	129.1	125.6	128.0	132.2	142.6	157.3
HU	43.1	59.7	67.4	67.3	79.7	85.1	95.9	112.9
PL	27.4	36.3	35.0	30.6	29.2	32.3	35.4	41.2
SI	-	52.1	55.7	59.8	67.2	70.4	82.8	91.3
SK	58.6	36.2	38.8	35.0	32.3	32.4	32.2	-
EA-15	-	62.4	63.9	62.6	64.9	68.4	71.8	77.3

Note: Loans include loans granted to corporations by domestic banks, financial intermediaries and other corporations, and loans obtained from abroad. The ratio of loans provided to corporations by domestic banks to GDP is about 23%.

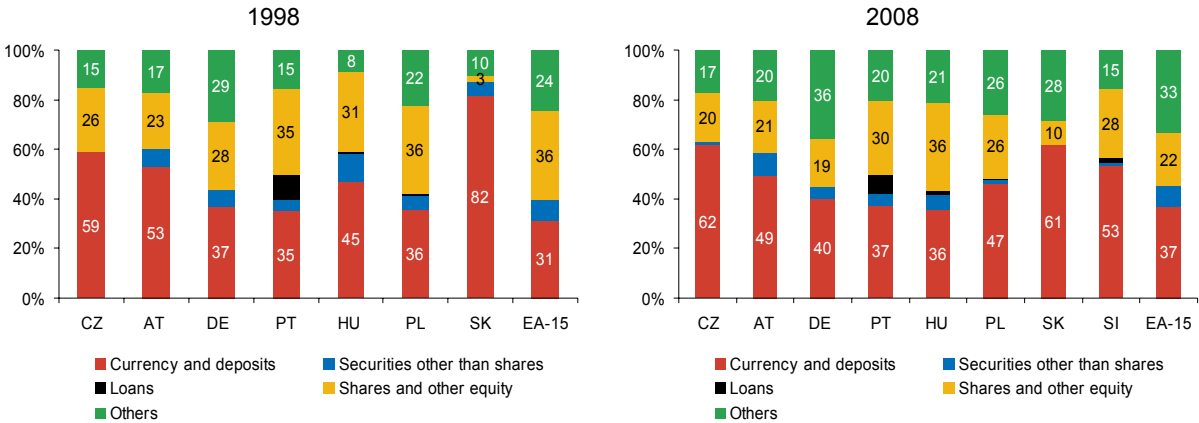
Sources: ECB, Eurostat, national central banks, CZSO, CNB calculations.

The structure of **financial assets of Czech households** also still shows some differences compared to the euro area (see Chart 23). The share of currency and deposits in the Czech Republic is, together with Slovakia, the highest. This is mostly due to Czech households' conservative approach and preferences when deciding on financial investment. Household deposits are meanwhile banks' main primary source for financial intermediation in the economy. In 2008, the share of currency and deposits of households increased in most of the

⁶⁹ Nonetheless, Czech corporations are also showing a rising default rate, although it is still at a safe level.

countries under review owing to uncertainties linked with the global financial crisis. The share of household investment in insurance and pension funds (under other accounts receivable) is substantially lower in the Czech Republic than the euro area average, despite a modest increase between 1998 and 2008. Austria has a similar household financial asset structure. In the present situation of global financial and economic crisis, a higher share of cash and deposits and a lower share of less liquid financial assets are an advantage, allowing partial smoothing of shocks arising from the fall or slowing growth in household income.

Chart 23: Financial assets of households

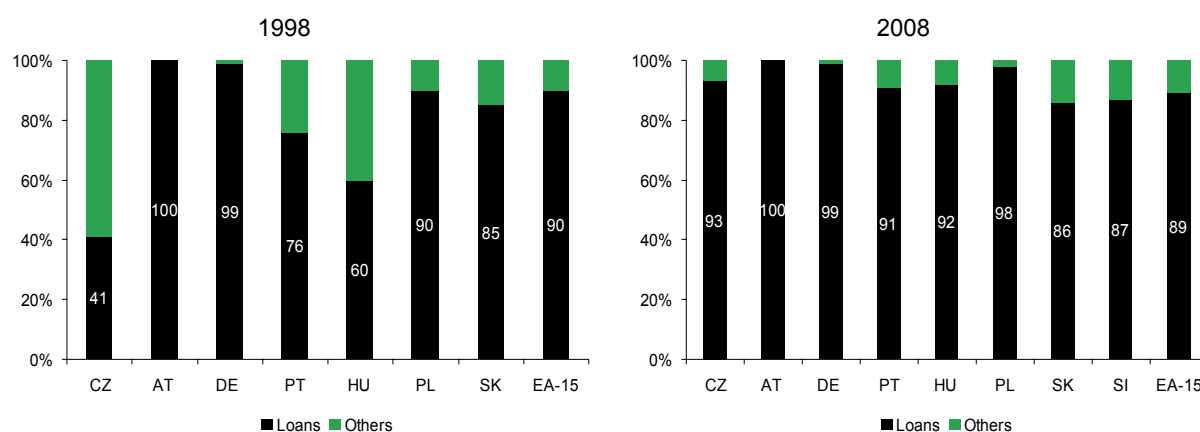


Note: Data for 1998 are available only for the Czech Republic and Slovakia; for the other countries the 1999 data were used (data for Slovenia are not available even for 1999).
Sources: ECB, national central banks, CNB calculations.

Loans dominate **households’ financial liabilities** in all the countries under review (see Chart 24). The share of other liabilities in the Czech Republic decreased significantly in 2008 owing to a change in the statistical reporting of the financial accounts.⁷⁰ This had a sizeable effect on the overall structure of households’ balance sheets, particularly their financial liabilities. At present, the structure of households’ financial liabilities in the Czech Republic is almost aligned with the euro area and the other countries under review.

⁷⁰ As part of the regular revision of the annual national accounts, the CZSO made substantial methodological changes for 2006 and 2007, changes which were also reflected in the quarterly financial accounts.

Chart 24: Financial liabilities of households



Note: Data for 1998 are available only for the Czech Republic and Slovakia; for the other countries the 1999 data were used (data for Slovenia are not available even for 1999).

Sources: ECB, national central banks, CNB calculations.

Czech household debt, as measured by the ratio of loans from both banks and non-banks to GDP (see Table 23), increased in the period under review and reached 28% in 2008. Nonetheless, it is still lower than in the traditional euro area countries under review and broadly comparable to countries of the Central European region. The different sensitivity of households to a higher unemployment rate and lower nominal wage growth may pose a risk with respect to debt servicing.⁷¹ In addition, households have a lower **ratio of gross savings** to gross disposable income in the Czech Republic than in all the euro area countries under review except Slovakia (see Table 24).

Table 23: Household debt (bank and non-bank, % of GDP)

	1998	2002	2003	2004	2005	2006	2007	2008
CZ	6.5	9.8	11.7	14.0	18.1	19.8	23.6	28.0
AT	43.9	48.6	49.0	51.2	54.3	53.5	53.4	53.8
DE	68.9	71.8	71.8	70.5	69.4	67.0	63.5	61.1
PT	48.6	70.0	75.0	79.7	84.9	89.8	94.2	96.0
HU	4.0	11.3	16.5	20.0	23.1	25.6	29.2	36.3
PL	6.4	12.9	13.7	14.3	16.3	19.8	23.9	30.5
SI	-	15.9	16.3	16.8	19.4	22.3	25.7	26.1
SK	5.6	8.6	10.3	10.7	16.1	20.4	24.2	21.7
EA-15	-	51.0	52.9	54.9	57.8	59.7	60.6	61.0

Sources: ECB, Eurostat, national central banks, CZSO, CNB calculations.

⁷¹ In the Czech Republic, this is already being reflected in a higher household default rate. As in the case of Czech corporations, however, the default rate is still relatively low.

Table 24: Gross saving ratio of households (% of gross disposable income)

	1998	2002	2003	2004	2005	2006	2007	2008
CZ	9.2	8.1	7.4	5.7	8.1	9.1	8.8	10.2
AT	13.3	12.9	14.0	14.1	14.5	15.4	16.3	15.9
DE	15.9	15.7	16.0	16.1	16.3	16.2	16.7	17.2
PT	10.5	10.6	10.5	9.7	9.2	8.1	6.2	6.5
HU	-	11.4	9.2	11.6	11.4	12.0	-	-
PL	14.4	8.4	7.8	7.2	7.2	6.6	8.1	7.0
SI	-	16.1	13.9	15.4	17.0	17.1	16.4	17.3
SK	12.4	8.9	7.1	6.3	6.9	6.1	7.7	7.0
EA-15	-	14.8	14.6	14.5	14.0	13.7	13.9	-

Source: ECB.

To sum up, the structure of financial assets and liabilities of domestic non-financial corporations and households still differs somewhat from the euro area, particularly as regards the share of trade receivables of corporations. In general, however, the structure of domestic corporations' balance sheets has converged further towards euro area levels. The indebtedness of Czech corporations and households is still much lower than in the euro area countries under review, which is an advantage in the present situation. The gross saving ratio increased in 2008, but is lower than in most of the euro area countries under review.

1.3.3 Effect of monetary policy on client interest rates and the volume of new loans

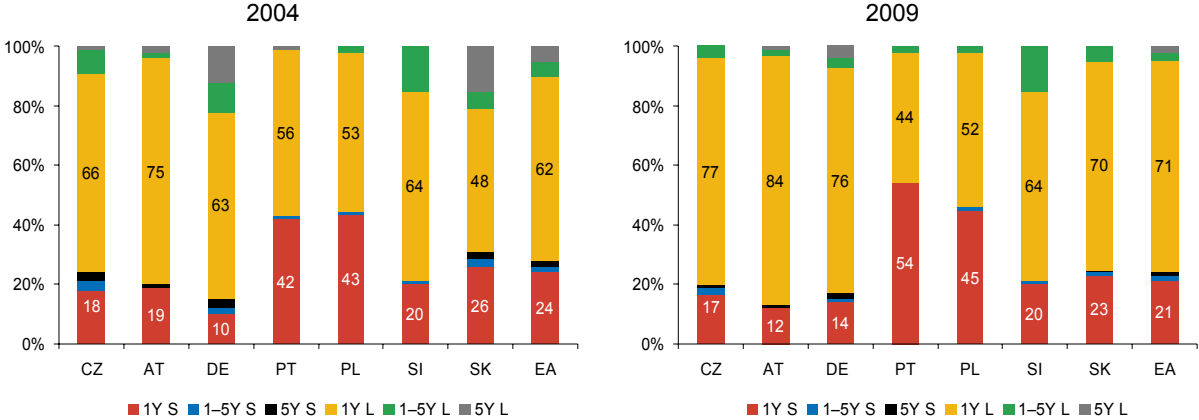
A key question generally related to the **efficiency of transmission of monetary policy to the economy** is how the interest rate conditions of credit financing of non-financial corporations and households are affected via financial market rates and how changes in client interest rates affect the volume of new loans. Some degree of similarity of such mechanisms is important if the single monetary policy is to have a symmetric effect.

In the Czech Republic, **client interest rates on new loans** are derived mainly from money market rates, according to the results of an empirical analysis (CNB, 2009). Rates on new loans for house purchase and small loans to corporations (up to CZK 30 million) with long interest rate fixations are also strongly affected by yields on long-term government bonds. Gradual transmission of changes to financial market rates is found for most types of client products. Rates on loans to non-financial corporations with short fixations usually react within one month, whereas the reaction of rates with longer fixations is mostly slower. Rates on loans for house purchase tend to react gradually. In the euro area, client interest rates with short fixations are also mostly derived from money market rates, and long-term rates from long-term government bond yields (ECB, 2007). The transmission is faster in the case of loans to non-financial corporations and loans for house purchase than in the case of consumer credit. However, slower, or stickier, transmission of client interest rates than in the euro area was recorded after the escalation of the global financial crisis, owing to rising risk premia for most credit products.

The **interest rate sensitivity of new loans to non-financial corporations** in the Czech Republic is similar to that in the euro area. This is indicated by the evolution of interest rates with different fixations and the structure of new loans to non-financial corporations. Corporations in the Czech Republic, as in most of the other countries under review, mainly demand large loans with floating interest rates or rates fixed for up to one year (see Chart 25), as rates on such loans have long been lower than those on other loans. Only Portugal and

Poland have a different structure, with small loans with floating rates or short rate fixations dominating.

Chart 25: Structure of new loans to non-financial corporations by interest rate fixation

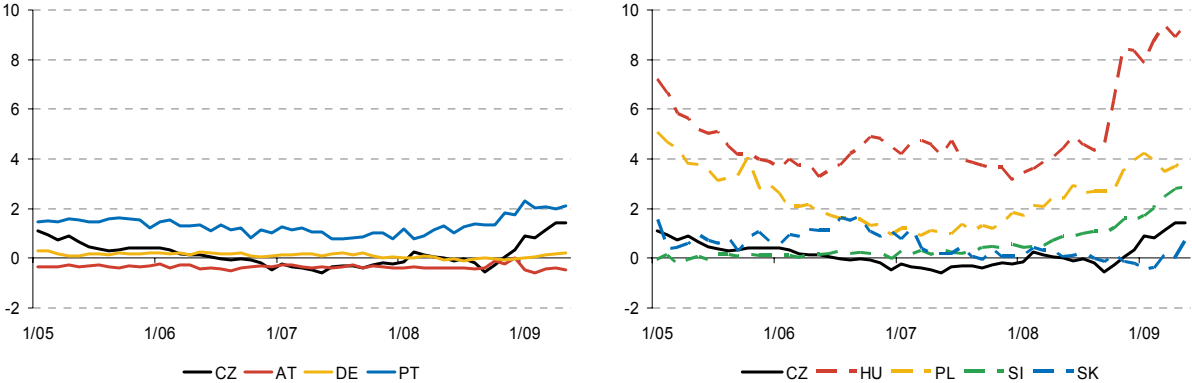


Note: 1Y S and 1Y L stand, respectively, for small and large loans with a floating rate or a rate fixed for up to one year, and the other items in the key denote such loans with longer interest rate fixations. The structure of the euro area total varies according to the number of euro area member countries in each year. The 2009 data are up to May.

Sources: ECB, national central banks, CNB calculations.

In 2005–2008, the **differences in interest rates on loans to non-financial corporations** compared to the euro area were small or falling in most of the countries under comparison, Hungary being the exception (see Chart 26). The difference in interest rates between the Czech Republic and the euro area was roughly zero until the end of 2008 but then increased, mainly because of a slower decline in money market rates. All the countries under review except Germany and Austria saw similar developments, albeit with differing intensities.

Chart 26: Differences in interest rates vis-à-vis the euro area, loans to non-financial corporations (new business, p.p.)



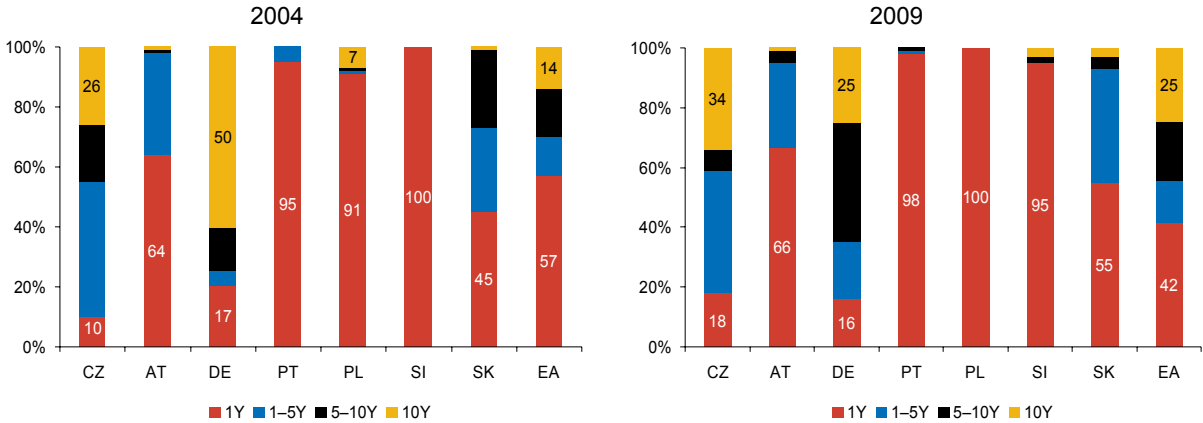
Note: The data for Poland and Slovakia are calculated from interest rates on large loans with fixations of up to one year. As from 2009, interest rates on euro loans are used for Slovakia. The differences in interest rates for the Czech Republic, Hungary and Poland are calculated from new loans in their domestic currencies. Hungary and Poland would show smaller differences in the case of interest rates on new euro loans. The 2009 data are up to May.

Sources: ECB, national central banks, CNB calculations.

In the case of households, by contrast, in the **structure of new loans to households for house purchase** (the largest segment of household debt), about 80% of loans have long interest rate fixations of over one year (see Chart 27). This is more than the euro area average. Germany has a similar structure of new loans for house purchase by rate fixation. In 2004–2009, the

share of loans with longer fixations increased in both the Czech Republic and the euro area as a result of a widening negative spread between rates with long (over one year) and short fixations. At the start of 2009, this spread increased in the countries under review. It was flat in the Czech Republic owing to relatively stickier short-term and long-term interest rates. In Portugal, Poland and Slovenia, the rates on almost all loans for house purchase are fixed for up to one year. This reflects some heterogeneity in households' preferences and in the interest rates on individual products compared to the euro area average.

Chart 27: Structure of new loans to households for house purchase by interest rate fixation



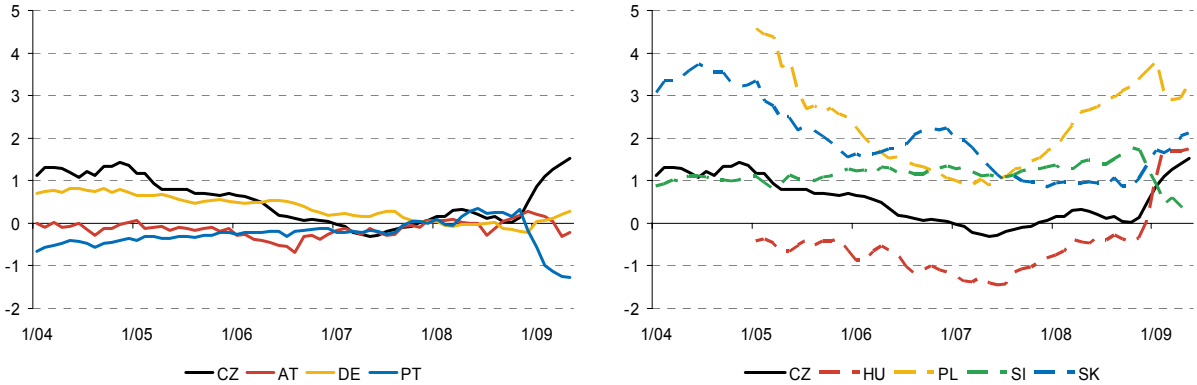
Note: The structure of the euro area total varies according to the number of euro area member countries in each year. The 2009 data are up to May.

Sources: ECB, CNB calculations.

Convergence of interest rates on loans for house purchase was apparent until the global financial crisis escalated (see Chart 28). However, rate developments were subsequently very mixed across the individual countries under review, reflecting some structural differences.⁷²

⁷² Growth in the risk premium in the Czech Republic, in most CEE countries and to a lesser extent also in Germany; different structure of new loans by rate fixation in Portugal and Slovenia, with prevailing lower rate on loans with short-term fixation.

Chart 28: Differences in interest rates vis-à-vis the euro area, loans for house purchase (new business, p.p.)

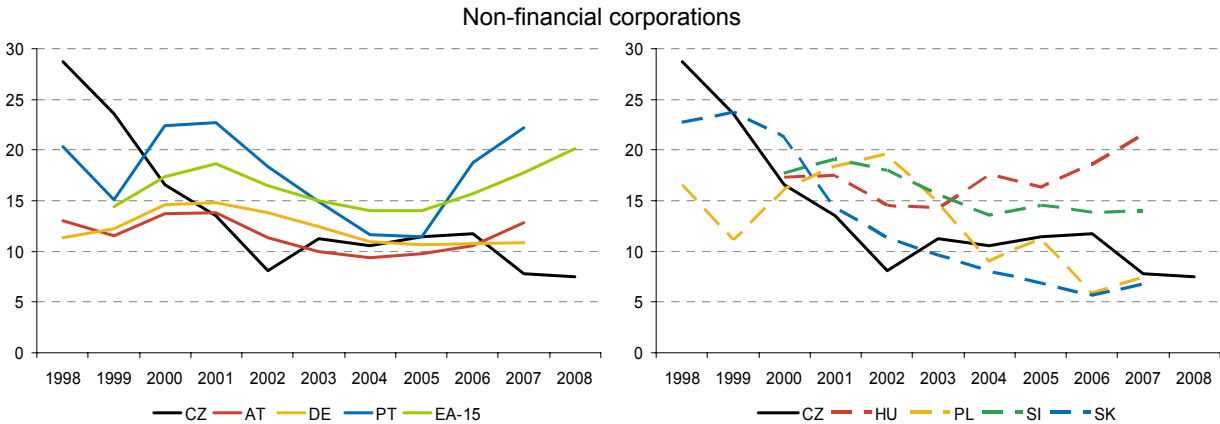


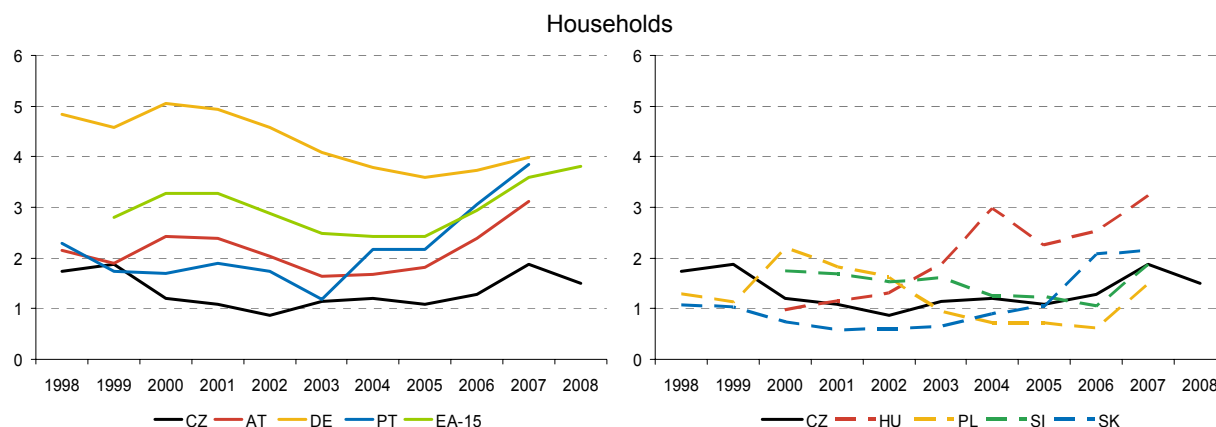
Note: The 2009 data are up to May. The differences for Hungary are calculated from interest rates with fixations of up to one year (which have the largest share) on new loans for house purchase in CHF. The data for Slovakia are in the domestic currency up to 2008 and then in the euro.

Sources: ECB, national central banks, CNB calculations.

Having a similar **interest burden** eliminates different impacts of interest rate changes on the finances of non-financial corporations and households (see Chart 29). The interest burden on corporations and households in the Czech Republic is lower than the euro area average, owing to lower indebtedness of both sectors. Within the Central European region, Poland, Slovenia and Slovakia have similar burdens. On the other hand, non-financial corporations in Portugal and Hungary and households in Germany have a higher interest burden. The interest burden trend in the Czech Republic, as in the other countries under review, shows some differences from the euro area average, Germany and Austria.

Chart 29: Interest burden (ratio of interest paid to gross operating surplus or gross disposable income, %)





Note: The interest burden represents the ratio of interest paid to gross operating surplus in the case of non-financial corporations and the ratio of interest paid to gross disposable income in the case of households.

Sources: Eurostat, CZSO for households since 2005, CNB calculations.

Overall, the transmission of financial market interest rates to client rates is broadly similar to that in the euro area. However, after the global financial crisis escalated, the transmission became stickier owing to a rise in the risk premium on most credit products. The interest rate sensitivity of new loans to non-financial corporations corresponds to the situation in the euro area and that of new loans for house purchase corresponds most to the situation in Germany. The other countries under review show some heterogeneity linked with households' preferences and with the interest rates on individual products. Since the escalation of the global financial and economic crisis, the spreads vis-à-vis the euro area have widened for interest rates on loans both to non-financial corporations and to households for house purchase. Thanks to lower indebtedness, the interest burden on both non-financial corporations and households is below the euro area level. Of the countries under review, Germany and Austria show the greatest similarity with the euro area.

Box 2: The different monetary policy approaches of the CNB and the ECB during the global crisis

The increase in the differential of client rates available in the Czech Republic and in the euro area (see Chart 26 and Chart 28) was very probably due to the different monetary policies in the two currency areas during the recent financial and economic crisis.

To satisfy banks' liquidity needs and mitigate the spillover of the adverse effects of the financial crisis to the real economy, the ECB used, in addition to monetary policy rate cuts (see Chart 30), instruments aimed at supporting banking sector liquidity and at reducing the costs and increasing the availability of financing. The addition of unconventional monetary policy instruments to the ECB's range of instruments was intended above all to reduce the spread between the monetary policy rate and interbank market rates (see Chart 31) in a situation where the previously relatively direct transmission of policy rates to market and client rates was not working because of impaired confidence on the interbank markets. The changes made to the ECB's instruments (see Table 25) had a great effect on monetary policy. For example, the one-year refinancing operation conducted in June 2009 at an interest rate of 1% was many times greater in volume than any previous refinancing operation. Together with other refinancing operations, it helped financial institutions to create a liquidity buffer. The new instruments ultimately generated a decrease in interbank market rates and subsequently created room for a fall in client interest rates in the euro area countries despite a worsening economic outlook.

Chart 30: Monetary policy interest rates

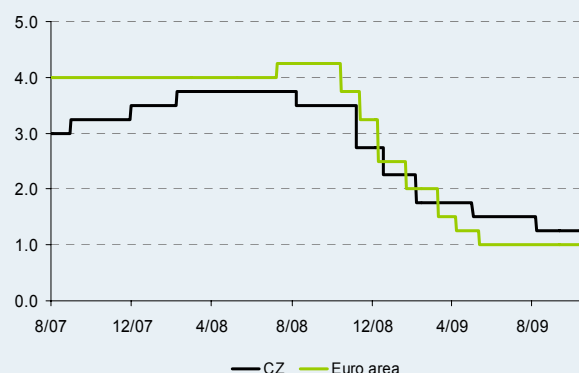


Chart 31: Spread between interbank and monetary policy interest rate



Note: The monetary policy rate chart shows the CNB's two-week repo rate and the ECB's one-week main refinancing rate. The spread between the interbank rate and the monetary policy interest rate is calculated as the difference between the 3M PRIBOR and the 2W repo rate for the Czech Republic and the difference between the 3M EURIBOR and the 1W main refinancing rate for the euro area.

Sources: Thomson Datastream, CNB calculations.

The CNB responded to the adverse effects of the crisis on the financial markets and the real economy almost exclusively by lowering monetary policy interest rates. The reasons included a concurrent easing of the monetary conditions via a depreciation of the koruna, coupled with the characteristics of the Czech financial system. This system has persistent excess liquidity and the CNB usually conducts liquidity-absorbing repo operations. To prevent potential liquidity problems in commercial banks and to support the functioning of the secondary government bond market, liquidity-providing repo operations were introduced at the end of 2008 (see Table 25). Although commercial banks did not make much use of them, they had a significant signalling effect and helped to ease the problems on the bond market. The high balance-sheet liquidity of the Czech financial system and of individual banks is also due to a high ratio of deposits to loans. Unlike in the euro area, however, no reduction in the spread between the interbank rate and the monetary policy rate has yet been observed in the Czech Republic. This factor, together with rising Czech government bond yields, which affect the price of longer-term funds in the banking sector, is the reason why the Czech Republic has so far not seen a decrease in client interest rates similar to that in the euro area.

Table 25: Main changes in ECB and CNB instruments

Main changes in ECB instruments	Main changes in CNB instruments
<p>Changes in refinancing (liquidity-providing) operations</p> <ul style="list-style-type: none"> - new 6M and 12M maturities - fixed refinancing rate - full allocation - wider range of eligible collateral - EIB as refinancing operation counterparty <p>Instruments aimed at reducing spreads of selected types of assets and supporting market together with forex financing</p> <ul style="list-style-type: none"> - purchases of covered bonds - currency swap lines 	<p>Introduction of liquidity-providing repo operations</p> <ul style="list-style-type: none"> - 2W and 3M maturities - repo rate + 10 b.p. (2W) and 30 b.p. (3M) - full allocation at fixed rate - Czech government bonds accepted as collateral

Sources: CNB, ECB.

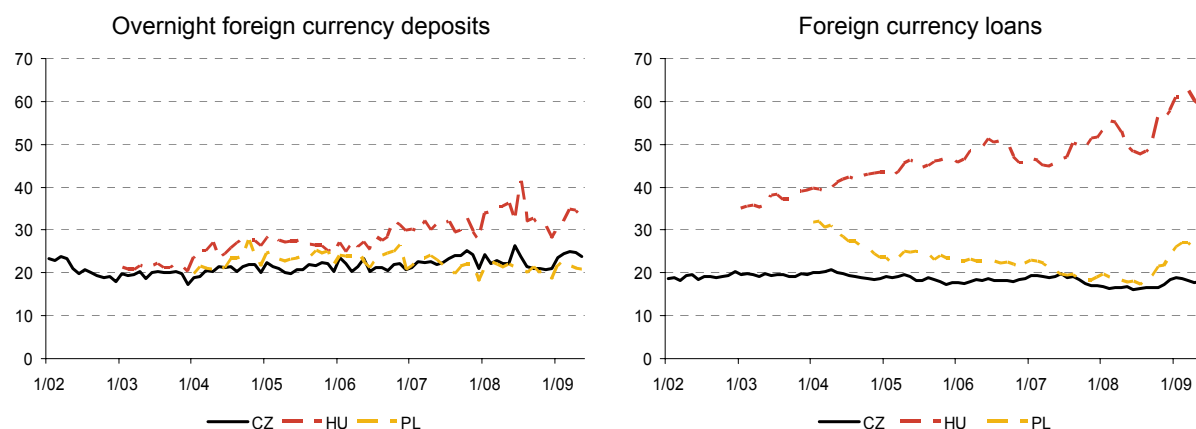
1.3.4 Spontaneous euroisation

Spontaneous euroisation can reduce the effectiveness of independent monetary policy. It is usually signalled by rising foreign currency demand among economic agents, manifesting

itself in an increase in the share of foreign currency loans and deposits. Higher shares of foreign currency loans are typical of small and less advanced countries, mainly because of higher interest rate differentials and bank financing from abroad.⁷³ Spontaneous euroisation in the Czech Republic is limited by confidence of economic agents in the domestic currency, by low inflation, which is reflected in low interest rates, and by exchange rate fluctuations, which do not motivate agents (except for exporters) to substitute the domestic currency with foreign currency. The degree of euroisation is low for households, whereas the use of the euro by non-financial corporations in financial transactions is gradually increasing because of the openness of the economy and the involvement of corporations in foreign trade.

The share of foreign currency loans drawn in the Czech Republic by **non-financial corporations** has long been low, at around 20% (see Chart 32). This is much lower than in Hungary and slightly lower than in Poland. The share of foreign currency loans drawn by Czech corporations abroad is about 70%. Such loans are drawn mainly by foreign-controlled corporations, most of them exporters, which are sensitive to unexpected exchange rate variability and, in addition, have income in the euro and are more inclined to use the euro for payments for domestic inputs. The share of overnight foreign currency deposits in total overnight deposits, which indicates the degree of use of foreign currency in corporate transactions, has been fluctuating close to, or just above, 20% since 2002 and is currently around 24%. The share of overnight euro deposits (about 20% of total domestic overnight deposits in 2009) is increasing, whereas the share of other foreign currencies is flat or falling. The use of overnight foreign currency deposits in the Czech Republic is higher than in Poland, but lower than in Hungary.

Chart 32: Overnight foreign currency deposits and loans of non-financial corporations (shares in total domestic overnight deposits and loans of non-financial corporations, %)



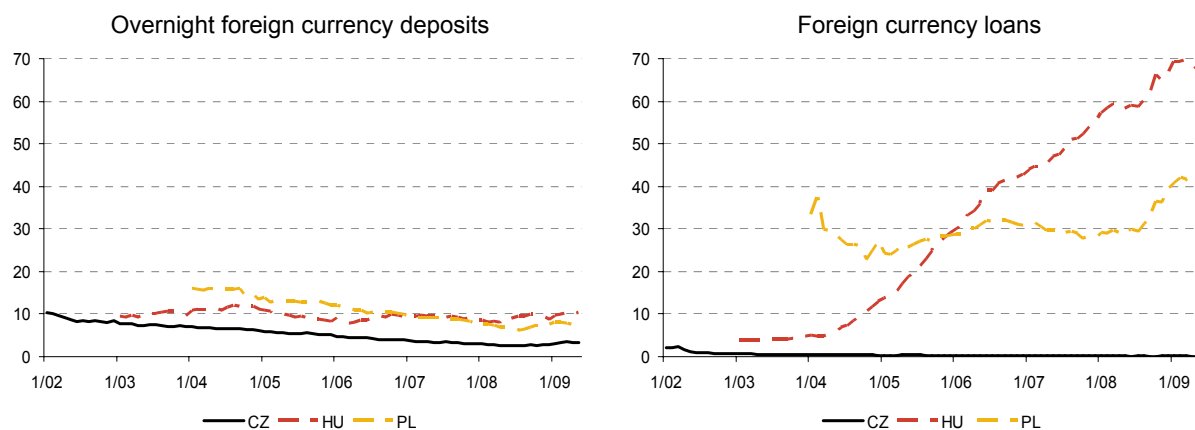
Sources: ECB, CNB calculations.

The substitution of the domestic currency with foreign currency, or the euro, is much lower for **Czech households** than for corporations. The share of overnight foreign currency deposits of households declined steadily as from 2002. Although it has been rising slightly since around mid-2008, it amounted to only 3% at the end of 2009 H1 (see Chart 33). Foreign currency savings deposits with agreed maturity followed a similar trend, but their share in

⁷³ Banks thus pass their exchange rate risk on to their clients, although this increases their credit risk.

total savings deposits is higher than that of overnight deposits.⁷⁴ The depreciation of the Czech koruna in late 2008 and early 2009 and increased concerns about the impacts of the global financial crisis have thus had only a limited effect on demand for foreign currency deposits. The proportion of household foreign currency loans has long been virtually zero, mainly because of a similar nominal interest rate on loans for house purchase as in the euro area in the last few years. In Poland and Hungary, nominal interest rates on loans for house purchase in the domestic currency are higher than those on foreign currency loans, fostering much higher borrowing in foreign currency.

Chart 33: Overnight foreign currency deposits and loans of households (shares in total domestic overnight deposits and loans of households, in %)



Sources: ECB, CNB calculations.

To assess the **initial impacts of the escalation of the global financial crisis on the degree of euroisation** in the Czech Republic and selected Central European countries, we used the results of an Oesterreichische Nationalbank survey (Oesterreichische Nationalbank, 2009). At such times, households generally change the structure of their financial assets in order to maintain the value of their savings. In addition, the depreciation of domestic currencies recorded in these countries increased the opportunity costs of holding those currencies. The survey was conducted in October and November 2008, when the first signs of the global financial crisis began to be visible in Central European countries. At that time, the impact on the currency structure of households' financial assets in Central European countries was rather limited. Euro cash holdings and foreign currency deposits remained stable compared to the previous survey in spring 2008. The proportion of households holding cash and savings deposits in foreign currency in the Czech Republic remained similar to that in Slovakia and higher than that in Poland and Hungary in 2008 (see Table 26). The median of euro cash holdings in the Czech Republic increased slightly compared to the previous survey, but is still similar to that in Slovakia and Poland. In Hungary, the median is lower (see Chart 34). The survey also shows that the Czech Republic saw a slight decrease in confidence in the domestic currency, although it is still the highest of the countries under review (together with Poland), whereas in Hungary it is strongly negative (see Chart 35). Confidence in the euro also dropped slightly in all the countries under review.

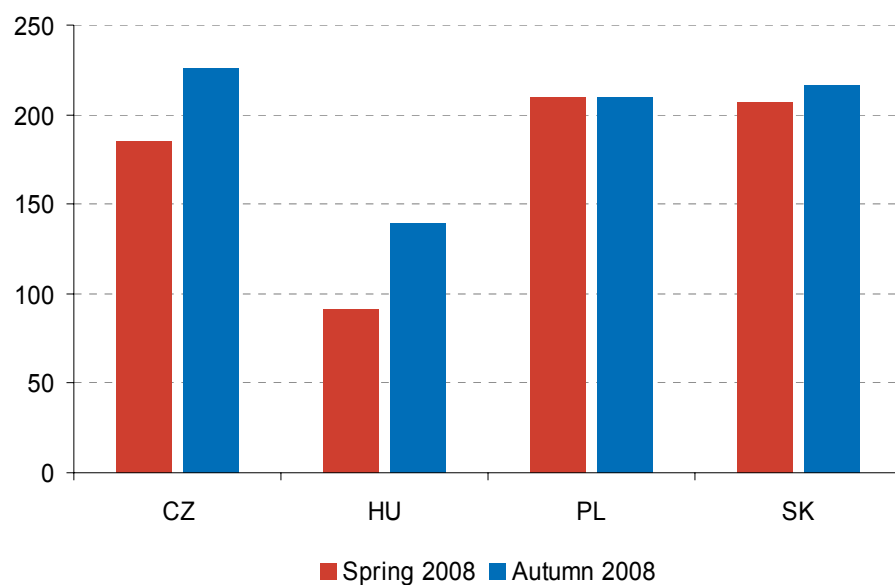
⁷⁴ Foreign currency savings deposits with agreed maturity account for about 12% of the outstanding amounts of deposits and 16% of new deposits.

Table 26: Foreign currency cash and savings deposits

	Cash in foreign currency	Cash in euro	Savings deposits	Savings deposits in foreign currency	Savings deposits in euro
	(% of total households)			(% of households with savings deposits)	
CZ	41	28	36	8	7
HU	10	9	23	10	8
PL	29	15	19	14	10
SK	45	24	39	11	10

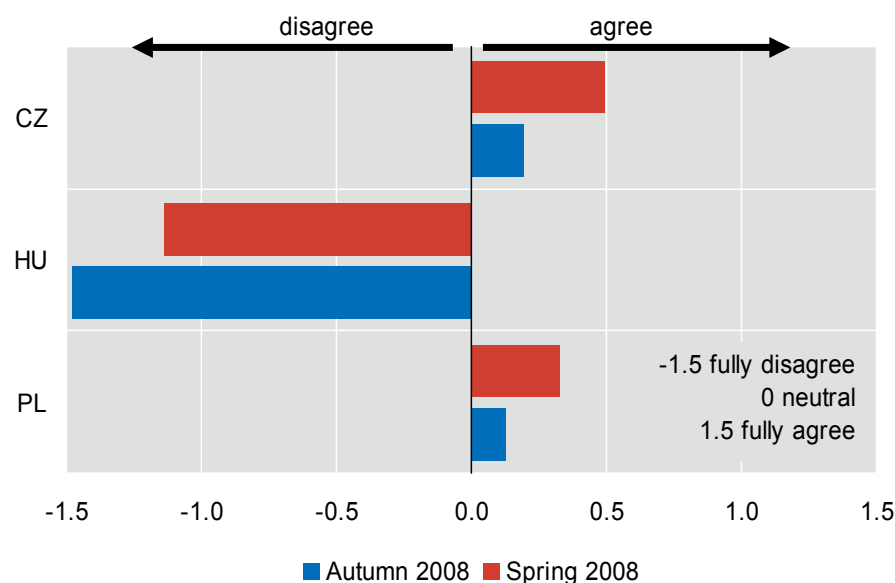
Source: Oesterreichische Nationalbank (2009).

Chart 34: Median of cash (EUR)



Source: Oesterreichische Nationalbank (2009).

Chart 35: Sentiment about the domestic currency



Note: Survey of stability and confidence in the domestic currency.

Source: Oesterreichische Nationalbank (2009).

The degree of euroisation of Czech households is thus still low in general, despite a modest increase in the share of overnight and savings foreign currency deposits. The use of the euro by non-financial corporations in financial transactions is gradually increasing as a result of their involvement in foreign trade.

1.3.5 Financial market integration

Financial market integration has been achieved when financial assets having similar risk factors and yields are priced identically by the markets no matter where they are traded. This follows from the law of one price.⁷⁵ The presented analysis of financial market integration applies two methods based on the law of one price: (i) price-based measures and (ii) news-based measures.⁷⁶ The more the individual segments of the financial markets of countries planning to adopt the euro become integrated with the European market, the more financial asset prices will be affected by common (global) factors rather than by local (national) factors. It can also be assumed that with increasing integration the individual financial market segments will become a less likely source of asymmetric shocks.

The following analysis focuses on the integration of the money, foreign exchange, bond and stock markets. The periods under review differ depending on the availability of data for the individual markets. The longest series cover the period from January 1995 to June 2009. Given the substantial financial market volatility resulting from the ongoing financial crisis, the periods before and after August 2007, when the first signs of the global financial crisis became apparent, are analysed separately.⁷⁷

1.3.5.1 Price-based measures

In line with Adam et al. (2002), the following analysis uses the concepts of beta-convergence and sigma-convergence to measure the process of financial market integration in the euro area countries.⁷⁸ The concept of beta-convergence enables identification of the speed at which differences in yields are eliminated on individual financial markets. A negative beta coefficient signals the existence of convergence, and the magnitude of the beta coefficient expresses the speed of convergence, i.e. the speed of elimination of shocks to the yield differential vis-à-vis the euro area. The closer the value of the beta coefficient is to -1, the higher is the speed of convergence. The concept of sigma-convergence focuses on the dispersion of differences between the yields on identical assets in different countries at a given moment in time and thus identifies the degree of integration vis-à-vis the euro area achieved at that moment in the individual financial market segments in the countries under review. Sigma-convergence arises if and when the sigma coefficient falls to zero. If there is beta-convergence, sigma-convergence may, but need not, arise at the same time. There may

⁷⁵ If the law of one price did not apply, there would be room for arbitrage. If we assume a fully integrated market with no barriers (economic, legal, cultural, etc.), then any investor will be able to use this arbitrage opportunity, causing the law of one price to apply again.

⁷⁶ The literature also provides some other approaches to measuring integration which are based not on the law of one price but, for example, on quantitative indicators (quantity-based measures) – various surveys of statistical information monitoring change in investor behaviour in the process of financial market integration.

⁷⁷ When interpreting the results, one should take into account that the examination of financial integration using the above methods in the period of a financial crisis and the related high volatility of market prices, is associated with a higher degree of uncertainty regarding their equilibrium values.

⁷⁸ The terms beta-convergence and sigma-convergence originate from the literature on economic growth and its dynamics; see, for example, Barro and Sala-i-Martin (1992, 1995).

even be sigma-divergence. For this reason, both concepts must be tracked concurrently in order to assess financial integration.

a) Period before August 2007

The results of the beta-convergence analysis, as applied to the individual segments of the financial market, are given in Table 27. In this period, the values of the beta coefficient were close to -1 for all the countries and markets except the money market, which means that the levelling of newly arising differences in yield differentials between the relevant national economy and the euro area can be labelled as fast. Moreover, the results of the sigma-convergence analysis (see Chart 36) for the individual segments of the financial market and the countries under review vis-à-vis the euro area (or Germany⁷⁹ for the bond markets) suggest that all the markets under review recorded rather gradual trend sigma-convergence and that the degree of integration for the individual countries and markets showed no major differences just before the outbreak of the crisis. In the Czech Republic, the fastest convergence took place in the foreign exchange market, followed by the stock and bond markets, whereas the convergence of the money market was the slowest as expected. The stock market, followed by the foreign exchange and bond markets, achieved the highest level of integration, whereas the level of integration of the money market remained broadly unchanged since the Czech Republic's accession to the EU.⁸⁰

Table 27: Beta coefficients

	Money market		Foreign exchange market		Bond market		Stock market	
	1/99–7/07	8/07–6/09	1/95–7/07	8/07–6/09	1/01–7/07	8/07–6/09	1/05–7/07	8/07–6/09
CZ	-0.57	-0.39	-0.93	-0.89	-0.73	-0.72	-0.79	-0.84
AT	-	-	-	-	-1.12	-0.75	-0.88	-0.57
DE	-	-	-	-	B	B	-0.78	-1.22
PT	-	-	-	-	-0.81	-0.68	-0.92	-0.84
HU	-0.79	-0.99	-0.87	-0.89	-0.87	-0.6	-0.81	-0.95
PL	-0.68	-0.69	-0.87	-1.04	-0.82	-0.74	-0.82	-0.91
SI	-	-	-	-	-	-	-0.78	-0.8
SK	-0.75	-0.56*	-1.07	-0.6	-0.77	-0.94	-0.72	-1.06
EA	B	B	B	B	-	-	B	B

Note: The closer the value of the beta coefficient is to -1, the higher is the speed of convergence; the first time interval in the analyses is the period before the outbreak of the financial crisis (up to July 2007); the second is the ongoing period of the financial crisis. Other symbols: B – benchmark, * - until 31 December 2008. All the estimates were statistically significant at the 1% level.

Sources: Thomson Datastream, CNB calculations.

b) Period after August 2007

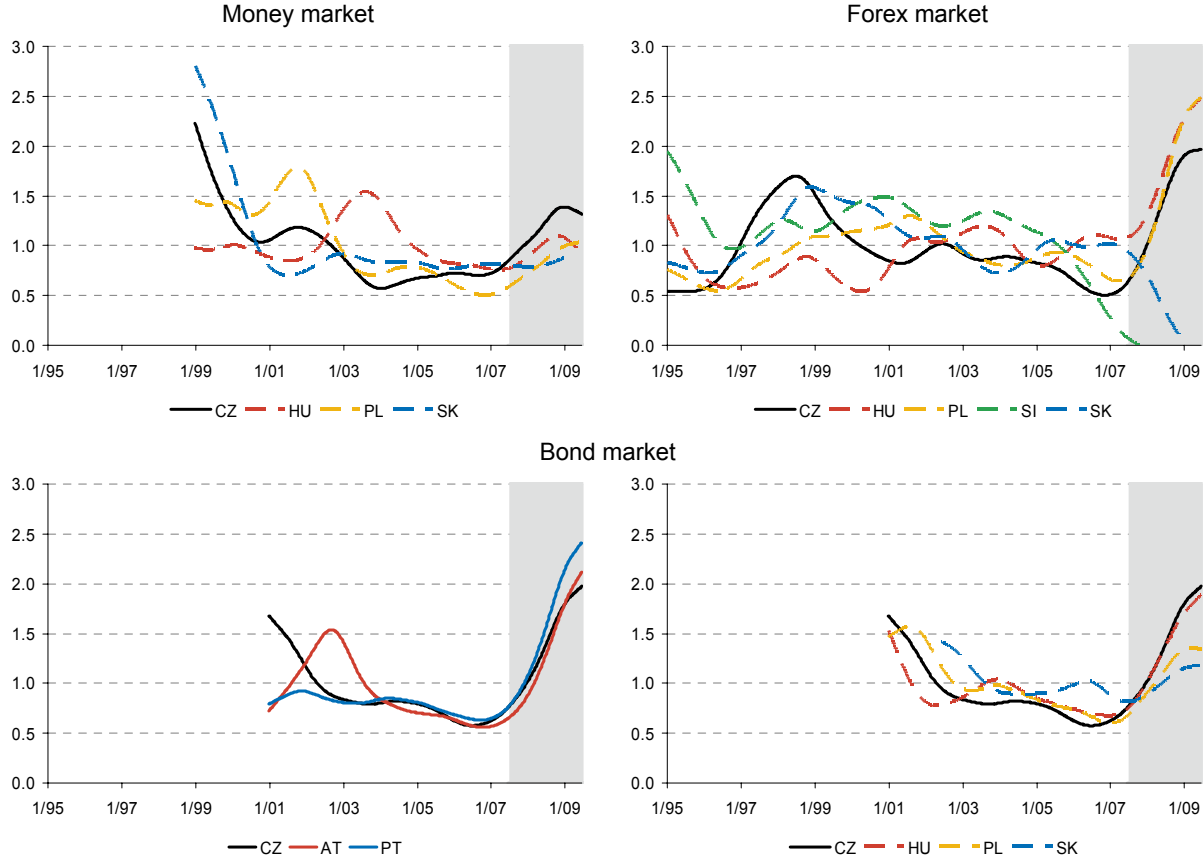
The developments on the individual markets from August 2007 onwards are illustrated in the relevant columns (08/07–06/09) of Table 27 and in the grey-shaded part of Chart 36. It is clear that all the countries and markets under review saw divergence and most of them also

⁷⁹ As in section 1.1.2, for example, any interpretation of the values for Germany should also take into account the fact that the data for Germany have a significant weight in the calculation of the data for the euro area (see the *Methodological Part* for details).

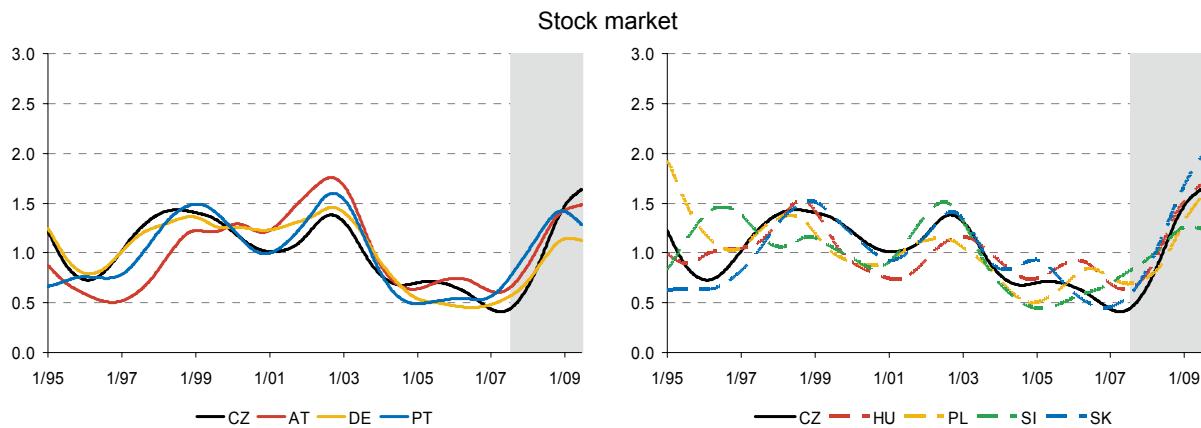
⁸⁰ In the case of the money market, yields on assets are affected primarily by the monetary policy decisions of the relevant central bank.

experienced a decline in the speed of adjustment.⁸¹ Substantial divergence was recorded on the Polish and Hungarian foreign exchange markets in particular. The bond and stock markets showed somewhat less divergence and the least divergence was seen on the money market. The degree of integration of the individual markets with the euro area thus decreased. The rate of decline in integration was comparable across both the candidate and member countries. The impact of the financial crisis across countries and markets thus seems significant. Unlike in the previous period, there is a prevalence of asymmetric, i.e. country-specific, shocks. This is connected with the high market volatility, the different impact of the crisis on each country under review, and the different crisis resolution methods adopted. Nonetheless, developments in recent months, particularly in the money market, suggest a gradual change back to a greater degree of integration.

Chart 36: Sigma coefficients



⁸¹ Convergence was recorded on the Slovak foreign exchange market in this period as a result of the euro adoption process.



Note: Lower standard deviation values (y-axis) correspond to a higher convergence level. The grey area marks the period since August 2007. For the presentation of the charts, the standard deviations were first normalised over their entire time period to facilitate comparison across markets and then filtered using the Hodrick-Prescott filter.

Sources: Thomson Datastream, CNB calculations.

1.3.5.2 News-based measures

An important sign of financial market integration is that asset prices should respond to common (global) news rather than to purely local shocks. In the case of full integration, i.e. identical responses to global news, still existing local shocks can be diversified by investment in other assets from the integrated region.⁸² However, if one simultaneously assumes that the economies under comparison get more alike with increasing integration, then some local shocks will become alike as well (see, for instance, the ongoing integration process in the euro area countries). It thus holds true for a fully integrated market that the degree of systemic risk is identical across assets issued in different countries, since their prices are primarily affected by common or global news.⁸³ News-based measures of financial integration are based on this assumption.⁸⁴ In line with these assumptions, the price movements of a benchmark asset should reflect all relevant common (global) news. Thus, in a fully integrated market, the price changes of an asset in a single country should not be systematically higher or lower than the price changes of the benchmark asset.

The sensitivity of asset prices to global news in individual countries is measured by the parameter γ , which shows the extent to which a country’s asset prices respond in the same way as the benchmark asset.⁸⁵ Put differently, γ represents the proportion of the change in asset prices which can be explained by common factors. Higher values of this parameter signal greater integration of the asset markets under comparison. Values greater than 1

⁸² Examples of common (global) news include the collapse of US investment bank Lehman Brothers in September 2008, a change in the OPEC oil extraction quota, a poor global harvest and global economic developments. Local news include the monetary policy decisions of a national central bank, a change of national government, deregulation of energy prices, a change in the extraction quota for a local deposit and developments in national GDP or unemployment.

⁸³ For example, the interest rate in a financially integrated market should be the same for borrowers of the same risk category regardless of origin, and the rate should be affected by factors common to all borrowers in this category. Similarly, the expected return on assets issued in different countries of the same risk characteristics should depend mainly on common factors.

⁸⁴ The analysis presented uses the method of Baele et al. (2004).

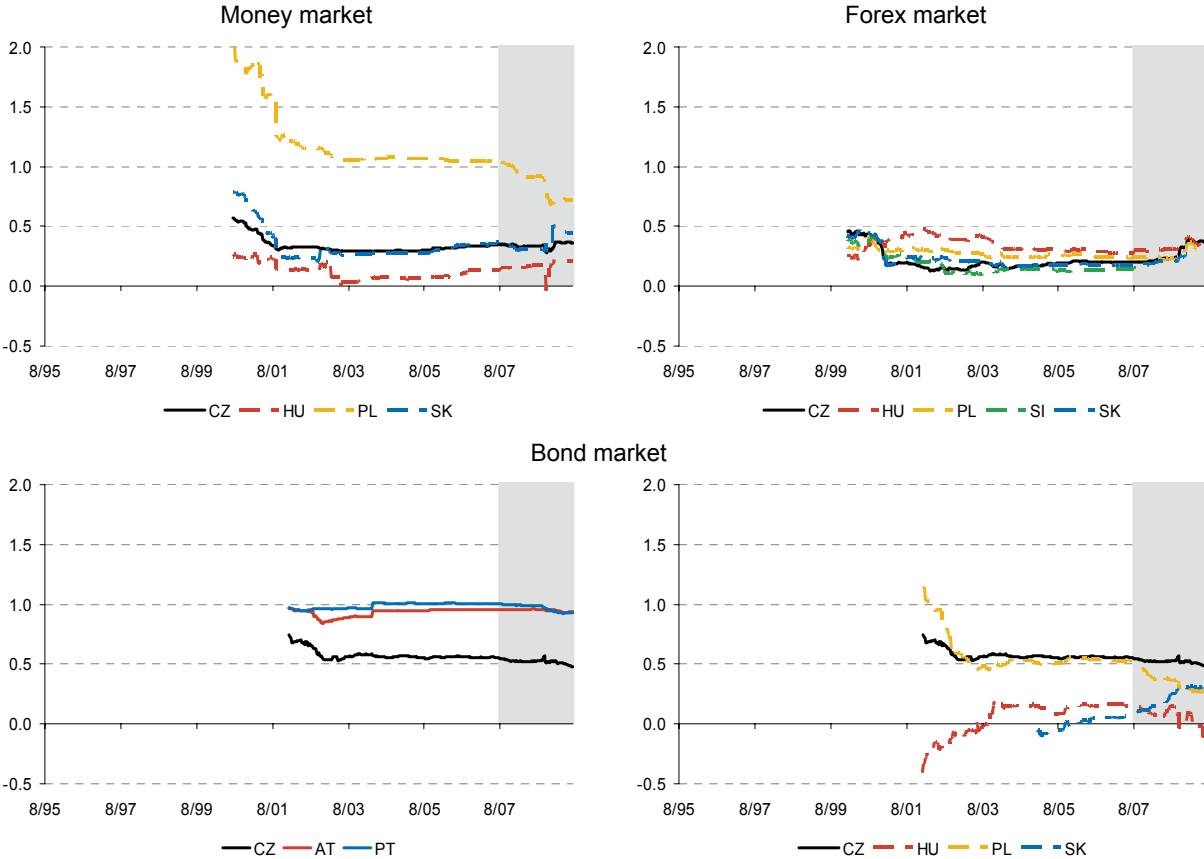
⁸⁵ Asset prices are monitored at an aggregate level and it is assumed that the benchmark asset responds to global news only.

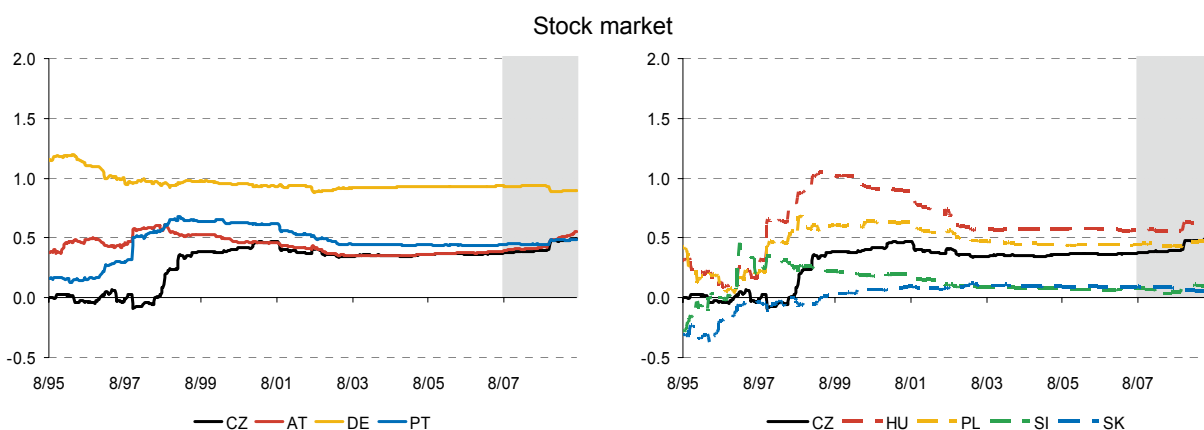
indicate a multiplication effect, i.e. a stronger response of the price of a local asset relative to the benchmark asset. Negative values express an asymmetric response to news (shocks).

a) Period before August 2007

Chart 37 shows the estimated γ parameters for the individual markets and countries over time. The highest degree of integration for the Czech Republic measured using the above method was obtained for the government bond market (γ around 0.6) followed by the stock market (γ around 0.5). By contrast, a lower degree of integration was achieved for the money market (γ around 0.35) and the foreign exchange market (γ around 0.2). As with the previous methods, the low degree of money market integration may reflect monetary policy differences across the selected countries and the euro area and, unlike on the stock market for example, the effects of idiosyncratic regional news (a change in the monetary policy rate of the relevant country) may prevail. Of the economies under review, only the Polish money market recorded high values of γ close to one. As regards the government bond market, where greater sensitivity to the spread of global news can be expected, the Czech Republic, together with Poland, had a much more integrated market than Hungary and Slovakia, but a much less integrated one than Austria and Portugal, where γ is close to one. The initially asymmetric movement in Hungarian government bond yields compared to Germany disappeared at the time of Hungary's accession to the EU, but its degree of integration remained low. The integration of the Slovak stock and bond markets also showed very low values, due to the shallowness of these markets. Overall, the charts show that the degree of integration mostly stabilised in the period between the candidate countries' accession to the EU and the start of the crisis, albeit at rather low levels.

Chart 37: Gamma coefficients





Note: Positive (negative) and rising (falling) γ values express same directional (opposite) sensitivity to news; values close to zero express indifference. For illustration, the grey area marks the period of the ongoing financial crisis.

Sources: Thomson Datastream, CNB calculations.

b) Period after August 2007

The impacts of the financial crisis on financial integration can also be examined using the news-based approach. However, these impacts are not identical and same directional across markets. The events of autumn 2008 resulted in a sudden change in sensitivity to global news on the money, foreign exchange and stock markets of the countries under review. In the Czech Republic, these markets recorded a general rise in alignment, i.e. the selected Czech financial markets and relevant benchmark assets responded to news in a similar manner in the period under review. By contrast, Poland saw a decrease in alignment on the money market, probably due to the rising importance of national monetary policy, rising risk premia and falling foreign currency lending. The level of alignment of the Polish money market thus moved closer to the other candidate countries. The sensitivity on the government bond market remained roughly at the previous period's level in the Czech Republic, Austria and Portugal, decreased⁸⁶ in Hungary and Poland and increased in Slovakia until it entered the euro area.

To sum up, both methods confirmed a significant impact of the financial crisis and its effects on the process of financial market integration in the Czech Republic and the other countries under review with the euro area. The first method reveals that since the start of the crisis the individual financial assets have responded more to local asymmetric shocks than to global factors associated with symmetric shocks, while the news-based method signals a higher degree of identical response to global shocks. However, the low or reduced (according to the price-based measures method) level of market alignment is due not to the introduction or existence of new barriers restraining investment in financial assets across the region under review in a targeted fashion, but rather to a general increase in financial market volatility, differentiated growth in credit and liquidity risk as a significant component of asset prices, different impacts of the crisis on the individual countries and the related corresponding response of these countries.

⁸⁶ This also reflected, for example, in different movements in the five-year credit default swap for the individual candidate countries.

2 ADJUSTMENT MECHANISMS

The adoption of the single currency and the loss of an independent monetary policy will mean that the adjustment of the economy to shocks will place higher demands on other adjustment mechanisms. The theory of optimum currency areas indicates the importance of the stabilising function of public budgets, price and wage elasticity, labour market flexibility and the ability of the financial system to absorb shocks.

2.1 Fiscal policy

After the loss of independent monetary policy, the stabilising effect of fiscal policy may to some extent substitute for the missing adjustment mechanisms in the event of asymmetric shocks. By contrast, fiscal policy may itself be a source of economic shocks if the parameters are set or measures chosen inappropriately. The current condition of, and in particular the outlook for, public finance is therefore an important factor that must be taken into account when considering the preparedness of the Czech economy to join the euro area.

2.1.1 Stabilising function of public budgets

From the perspective of the stabilising role of fiscal policy, a desirable public finance policy setup is one that does not cause large changes in market agents' expectations and creates a stable economic environment. The need for the stabilising function of fiscal policy will increase after euro adoption.

Fiscal policy can affect the economy either directly, via discretionary measures on the revenue or the expenditure side of the public budgets, or indirectly, by creating conditions for optimal functioning of automatic (built-in) fiscal stabilisers. However, the negative experience of the advanced countries in the 1970s is an argument against the wider application of discretionary measures under activist fiscal policy, since such policy failed to produce the desired and provable results or was counterproductive.⁸⁷ This was also reflected in a paradigm shift in theoretical economics, with belief in the effectiveness of discretionary measures being replaced by a hypothesis that adherence to pre-defined rules is more effective. In the fiscal area, such rules consist primarily in a simple, relatively stable tax system, consolidated and sustainable public finance and predictable government expenditure based on fiscal discipline. By contrast, activist fiscal policy can destabilise the economic environment.⁸⁸

The EU fiscal rules therefore consider the optimal situation to be a balanced government budget policy within the business cycle and the free operation of automatic fiscal stabilisers,

⁸⁷ The long and unpredictable lags that arise between the identification of shocks, the implementation of fiscal measures and the effects of those measures, the existence of institutional constraints and the inertia of fiscal decisions are general regarded as the main causes. A typical example of this problem is the risk of "pro-cyclical fiscal policy", i.e. fiscal policy that tries to smooth the business cycle (which can be viewed as one specific type of economic shock) but in reality – owing to the aforementioned lags – amplifies the cycle.

⁸⁸ During the current financial and economic crisis, however, numerous discretionary measures have been taken. It is too early to assess their overall effectiveness, but it is obvious that, in addition to positive impacts, the growth in fiscal deficits has its costs in the form of upward pressure on long-term interest rates, which may lead to crowding out of private expenditure by government expenditure.

which can moderate shocks without the need for ad hoc discretionary fiscal measures.⁸⁹ In a period of recession, public finance thus stimulates aggregate demand by means of deficits. By contrast, in a period of expansion, they should subdue demand by creating fiscal surpluses. In order for the automatic function of public budgets to work, while avoiding breaches of the maximum agreed deficits, public finance must be balanced or in surplus during a growth phase of the business cycle. This reasoning serves as the basis for the convergence criterion for the general government deficit as a percentage of GDP, where a 3% limit is considered sufficient to allow free functioning of automatic stabilisers in the event of a minor, i.e. normal economic downswing. If the recession is deeper, a greater likely impact on the deficit is assumed, and so an exemption from fulfilling this criterion is applied.

The influences of the macroeconomic environment and of interventions by the government on public budgets can be differentiated by decomposing the fiscal balance into the cyclical component, i.e. the part that results from the business cycle, and the “cyclically adjusted balance”, which yields information on how government fiscal policy contributed to fiscal performance. Moreover, for an even more precise assessment of the nature of the government’s fiscal policy in a given period, the “structural balance” is generally used. In addition to fluctuations caused by the economic cycle, this takes into account the effects of temporary or one-off fiscal measures that are not related to the long-term orientation of fiscal policy.

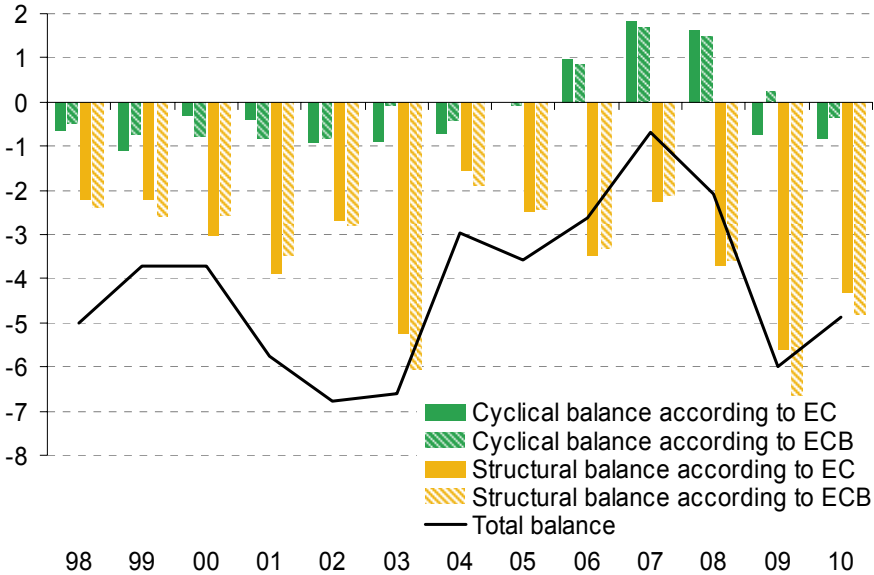
There are two main approaches to determining the cyclical component of the budget balance. The first is based on the methodology used by the European Commission and other international institutions (OECD, IMF), which assumes a direct relationship between the output gap and revenue/expenditure budgetary items which are subject to cyclical developments. The second approach, used by the ECB and central banks within the ESCB, is based on the relationship between individual revenue and expenditure budgetary items and their macroeconomic bases, which are variables (specifically, for example, private consumption or unemployment) that significantly affect such budgetary items over the business cycle. Each approach has its pros and cons (see the *Methodological Part*) and provides, of course, slightly different results. However, when interpreted correctly, they are sufficient to identify the basic characteristics of fiscal policy and the main trends in public budgets.

Chart 38 shows the CNB’s current estimates of the **Czech Republic’s general government balance broken down into its cyclical and structural components**. In order to improve the information content, the estimates are carried out using both the European Commission’s methodology and the ESCB’s methodology. Despite some differences in individual years, the two methods assess the trend in the structural balance in broadly similar ways. The cyclical component played a negligible role in 1998–2005 and the total fiscal deficit was practically identical to the structural component. The effect of automatic stabilisers, which respond to the

⁸⁹ The Stability and Growth Pact exerts pressure on the public finance of EU Member States so that they are able to fulfil their stabilising function particularly at times of recession, i.e. so that sufficient room is created for the functioning of built-in stabilisers and, in extreme cases, for fiscal discretion. In connection with the global financial crisis followed by the economic recession and the related public support provided to financial and non-financial institutions and corporations by the governments of EU Member States, many countries will considerably exceed the 3% deficit threshold. The currently applicable rules enable a deterioration in the fiscal position due to a sharp economic decline to be classified as extraordinary, without activation of the adjustment mechanisms under the preventive or corrective part of the Stability and Growth Pact. However, it can be expected that the excessive deficit procedure will be opened against some countries even in the crisis situation. This, however, will provide a framework for subsequent budget consolidation.

business cycle and smooth its fluctuations, was thus very limited in the Czech Republic.⁹⁰ The total deficit was worsened mainly by pro-cyclical government expenditure policy, since additional tax receipts were not consistently employed to reduce the fiscal deficit, but rather to generate new public expenditures. Similarly, tax cuts were not accompanied by corresponding measures on the public expenditure side even during years of solid economic growth. The Czech government sector deficits were thus due mainly to non-cyclical effects. The business cycle did not start to have a major effect until 2006 and 2008, when favourable economic growth (especially in 2005–2007) gave rise to extraordinary tax revenues. The CNB’s current estimates for 2009–2010 expect a sharp deterioration in the structural deficit, due mainly to the anti-crisis measures taken by the government and previous measures primarily affecting the revenue side of the public budgets. Moreover, the cyclical component of the public finance deficit will worsen following the economic slump in 2009.

Chart 38: Decomposition of the fiscal balance into its cyclical and structural components (% of GDP)



Note: Positive values represent a public budgets surplus and negative values a public budgets deficit. The sum of the cyclical and structural balance does not equal the total balance since the structural balance is adjusted for extraordinary one-off fiscal measures.

Sources: CZSO, CNB calculations.

2.1.2 Government deficit and debt and the scope for stabilising fiscal policy

Ensuring medium-term balance, or long-term sustainability, of public budgets is a precondition for effective use of their stabilising function and an important condition for the ability of the Czech Republic to fulfil its commitments under the Stability and Growth Pact in the long term. The ability of fiscal policy to react discretionarily or automatically to unforeseen shocks, while observing these commitments, is determined primarily by the gap

⁹⁰ Automatic stabilisers act in the direction of a deterioration in the fiscal balance at a time of economic recession and in the direction of an improvement in years of economic growth.

between the general government structural deficit and the reference value of 3% of GDP and by the gap between the government debt and the reference value of 60% of GDP. The fiscal policy objective in the run-up to euro area accession should be to take the public budgets close to a zero balance (or close to the Medium Term Objective – MTO)⁹¹ so that sufficient room is left for stabilising fiscal policy in less favourable times. Table 28 sums up the autumn 2009 figures and forecasts of the European Commission regarding the **fiscal balance** for the countries under review. The left-hand side of the table provides information on the total (unadjusted) government sector balance, while the right-hand side contains the structural balance calculated according to the European Commission’s approach. The last line in the table contains the current estimate for the total and structural balance according to the CNB forecast and the application of the ESCB’s approach to the calculation of the structural balance.

Table 28: General government balance, European Commission estimate (% of GDP)

	Total balance				Structural balance			
	2007	2008	2009	2010	2007	2008	2009	2010
CZ	-0.7	-2.1	-6.6	-5.5	-3.1	-4.1	-6.3	-4.7
AT	-0.6	-0.4	-4.3	-5.5	-1.7	-1.8	-3.3	-4.3
DE	0,2	0,0	-3.4	-5.0	-1.2	-1.1	-1.9	-3.6
PT	-2.6	-2.7	-8.0	-8.0	-3.0	-3.5	-6.6	-6.7
HU	-5.0	-3.8	-4.1	-4.2	-5.5	-4.8	-2.1	-2.1
PL	-1.9	-3.6	-6.4	-7.5	-2.9	-4.7	-6.4	-6.6
SI	0,0	-1.8	-6.3	-7.0	-2.6	-4.5	-4.7	-5.4
SK	-1.9	-2.3	-6.3	-6.0	-4.0	-5.2	-6.2	-5.4
CZ^{a)}	-0.7	-2.1	-6.0	-4.9	-2.1	-3.5	-6.6	-4.8

Notes: The general government deficit is calculated according to ESA95 methodology and the “Excessive Deficit Procedure” definition.

^{a)} Total balance: data according to the CZSO’s notifications (October 2009) for 2007 and 2008, and the CNB’s estimates for 2009 and 2010 from Inflation Report IV/2009. The structural balance is calculated under ESCB methodology. The difference from the European Commission’s data for the Czech Republic stems mainly from differences in the GDP forecast and related public budget revenues and expenditures, as well as from differences in the method of cyclical adjustment and a different procedure for defining one-off measures, which are deducted from the unadjusted balance prior to its cyclical adjustment.

Sources: European Commission (2009c), CNB.

Table 28 shows that following extraordinarily favourable economic developments, reflected at the peak of the cycle in 2007 in a significant improvement in the total general government balance in all the countries under review, most countries saw a deterioration in 2008 as a result of the financial crisis and the subsequent economic downswing. The outlook for 2010 expects a fall into large deficits for all the countries.⁹² This confirms that positive budget performance based mainly on extraordinary revenues due to cyclical and other temporary factors (including windfalls) and only partly on reform measures is not sustainable beyond the

⁹¹ The originally uniform requirement of balanced finances has been replaced under the amended European fiscal rules by country-specific medium-term objectives (MTOs), which differ from economy to economy depending on the existing level of public government debt and the prospects for economic growth. Fast growing economies with a low general government public debt level may, instead of maintaining balanced public sector accounts, reach a deficit of up to 1% of GDP. This is also the medium-term objective for the Czech Republic, which it again undertook to comply with by 2012 in the November 2008 update of the convergence programme.

⁹² According to Eurostat’s interpretation as regard ESA 95 accounting standards, the financial sector bail-out measures taken in some countries are largely not reflected in the current general government deficit and debt.

short term and creates insufficiently stable conditions for the economy. In this respect, the fact that the structural deficit in the countries under review remained relatively high at a time of favourable economic developments and buoyant growth in 2005–2007, except for a slight decline in 2007 due to non-standard factors, is a cautionary tale. There is probably a risk (in line with the commitments stemming from the Stability and Growth Pact) that most of the countries, including the Czech Republic, will be put under the excessive deficit procedure, the aim of which is to set an optimum strategy leading to the rapid stabilisation of public finance, i.e. to elimination of the excessive deficit by a specific date.

In addition to other effects, the government's room for manoeuvre for the application of stabilising fiscal policy is determined by the **nature of fiscal expenditure**. While the adoption of a government resolution or a change to a statutory instrument is sufficient to allow a change in some expenditures, changes to other expenditures require time-consuming and politically difficult amendments to laws or international treaties. From the economic perspective, the classification into mandatory, quasi-mandatory and non-mandatory expenditures is just a classification of the speed at which the government is able to alter such expenditures if the need arises.⁹³ Mandatory expenditures are the least flexible; nevertheless, most of them can be modified by means of suitable legislative amendments in the shorter or longer term. A systematic reduction in the share of mandatory expenditure in total expenditure was also one of the main fiscal policy objectives declared in the government's Programme Declaration in spring 2007. However, the current figures based on the government's draft state budget for 2010 indicate an adverse change in mandatory expenditures (see Table 29). Following a decline in the share of mandatory expenditure in total expenditure in 2007, the share increased again in 2008. After remaining roughly the same in 2009, it will rise next year as a result of the government's anti-crisis fiscal measures. These measures rely to a large extent on a reduction of non-mandatory expenditure, leading to an increase in the weight of mandatory expenditure in total expenditure. At the same time, the increasing deficit will require a significant rise in the absolute volume of mandatory government debt service expenditure, while an expected rise in unemployment will generate an increase in mandatory unemployment benefit expenditure. It is already clear that the original commitment in the government's April 2007 Programme Declaration to reduce the share of mandatory expenditure in total state budget expenditure below 50% by 2010 will not be met.

Table 29: Shares of mandatory state budget expenditure (%)

	2006	2007	2008	2009	2010
Shares of mandatory expenditure in total SB expenditure	51.3	50.8	53.7	53.5	55.6
Shares of mandatory expenditure in total SB revenue	56.7	54.1	54.6	55.4	64.4

Note: Data for 2006–2008 are actual figures; data for 2009 and 2010 are based on the government's September 2009 draft state budget.

Source: Ministry of Finance of the Czech Republic (2009).

The mandatory expenditures of individual countries are not directly comparable, as there is no harmonised definition of the term. However, the structure of general government revenue and expenditure provides some insight (see Table 30). Mandatory expenditures consist mainly of social payments and debt service spending. The Czech Republic ranked among the countries with the lowest figures in the selected sample for both indicators. By contrast, in 2008, as in

⁹³ The definition of mandatory expenditures applied in this analysis is given in the *Methodological Part*.

previous years, the Czech Republic was among the group of countries with the highest ratio to GDP as regards government investment expenditure (gross fixed capital formation).

Table 30: Ratios of public revenues and expenditures to GDP in 2008 (%)

	CZ	AT	DE	PT	HU	PL	SI	SK
Total revenue	40.9	48.2	43.8	43.2	46.5	39.2	42.7	32.7
- taxes	19.8	28.1	23.8	24.5	26.3	22.8	23.3	17.1
- social contributions	16.2	16.0	16.4	13.0	13.9	11.4	14.3	12.1
Total expenditure	42.4	48.6	43.9	45.9	49.8	43.3	43.6	34.9
- compensation of employees	7.6	9.1	6.9	12.9	11.6	9.8	10.8	6.6
- intermediate consumption	6.1	4.5	4.3	4.4	7.0	6.2	6.1	3.8
- social payments	12.7	18.1	16.9	15.6	15.9	14.1	14.7	11.3
- gross fixed capital formation	4.8	1.0	1.5	2.1	2.8	4.6	4.2	1.8
- interest expenditure	1.1	2.5	2.8	2.9	4.2	2.2	1.2	1.2

Source: European Commission (2009a).

The current stock of, and prospects for, **government debt** through its effect on debt service spending may also become factors limiting the stabilising ability of fiscal policy. Table 31 provides a comparison of the ratio of gross consolidated debt to GDP.⁹⁴

Table 31: Government debt (ESA95), European Commission estimate (% of GDP)

	2007	2008	2009	2010
CZ	29.0	30.0	36.5	40.6
AT	59.5	62.6	69.1	73.9
DE	65.0	65.9	73.1	76.7
PT	63.6	66.3	77.4	84.6
HU	65.9	72.9	79.1	79.8
PL	45.0	47.2	51.7	57.0
SI	23.3	22.5	35.1	42.8
SK	29.3	27.7	34.6	39.2
CZ^{a)}	29.0	30.0	35.7	39.2

Note: ^{a)} Data according to the CZSO's notifications (October 2009) for 2007 and 2008, and the CNB's current estimates for 2009 and 2010.

Sources: European Commission (2009c), CNB.

Like the other indicators, future debt (characterised by the gross consolidated debt indicator) is being affected by dramatic changes in the current economic situation. In all the countries under comparison, the slightly declining government debt path observed in previous years will be replaced by a more or less sharp increase in line with the growth in deficits and other extraordinary measures taken by individual countries to dampen the impacts of the recession. Although the Czech Republic with its government debt well below the 60% reference value is among the less indebted EU countries, the risk to its sustainability remains. After the current extraordinary situation subsides, it will thus be necessary to focus on structural changes, in particular reform of the pension and health insurance systems, which would reduce the otherwise inevitable increase in debt and thus also the mandatory expenditures connected with debt service (see Table 32).⁹⁵

⁹⁴ For the sake of comparability, the data are taken from the European Commission's autumn prediction.

⁹⁵ The figures in Table 32 are based on the European Commission's spring prediction and hence are not fully consistent with the European Commission's October 2009 prediction in Tables 28 and 31.

Table 32: Debt service, European Commission estimate (% of GDP)

	2007	2008	2009	2010
CZ	1.2	1.1	1.2	1.1
AT	2.7	2.5	3.0	3.2
DE	2.8	2.8	2.9	3.0
PT	2.8	2.9	3.0	3.3
HU	4.0	4.2	4.8	4.9
PL	2.3	2.2	2.9	3.0
SI	1.3	1.2	1.6	1.8
SK	1.4	1.2	1.3	1.4

Source: European Commission (2009a).

The recession has shown clearly that a high share of mandatory expenditures leaves only narrow room for the potential functioning of built-in stabilisers or the application of suitable fiscal policy instruments in less favourable times.

2.1.3 Sustainability of public finance

Sustainability of public finance, i.e. a moderate government deficit and debt in the medium and long term, is a key prerequisite for those finances to have a stabilising effect on the economy. Over this horizon, however, virtually all EU countries are exposed to the problem of population ageing and the related rise in pension, social and health expenditure, which may generate instability in the future. The long-term outlook for age-related government expenditure (mainly on pensions, health care and long-term care), based on an updated demographic forecast, is shown in Table 33.

Table 33: Age-related government expenditures (% of GDP)

	2007	2035	2060
CZ	7.8	7.6	11.1
AT	12.8	14.0	13.7
DE	10.4	11.8	12.7
PT	11.4	12.3	13.5
HU	10.9	11.5	13.9
PL	11.6	9.3	8.8
SI	9.9	14.8	18.7
SK	6.8	7.8	10.2

Source: European Commission (2009b).

Although the Czech Republic (together with Slovakia and Poland) has the lowest levels of age-related expenditure compared to the other selected countries (and also in the broader context of the EU), the expected increase in such expenditure compared to the current situation is sizeable. Moreover, it should be borne in mind that the forecast does not fully take into consideration the current developments in the economy. Economic shock scenarios that are close to the current economic situation and predict its long-term impact indicate a potential increase in age-related expenditure as a percentage of GDP of up to one-third as a result of a decline in economic activity that is deeper and more protracted than in the baseline scenario. Such a situation would clearly be unsustainable and would very probably lead to a substantial rise in gross government debt in the absence of fundamental pension and health system reforms. The institutional aspect of such developments also need to be taken into account, since a future tightening of the medium-term objectives arising from the Stability and Growth Pact cannot be ruled out, in the sense that the objectives will better

reflect the public budgets' implicit obligations necessary to cover the aforementioned costs of population ageing.

2.2 Wage elasticity and inflation persistence

Adjustment of real wages and prices is another mechanism, in addition to stabilising fiscal policy, that should aid in efficient absorption of shocks. Changes in real wages and in prices act as an impulse for economic agents to change their behaviour in a direction corresponding to a given shock.

2.2.1 Degree of adjustment of real wage growth to the unemployment rate (the Phillips curve)

The response of wages to changes in demand for labour is one of the methods of economic adjustment and a means of preserving a low unemployment rate. The following analysis assesses the ability of the Czech economy to dampen the impacts of shocks by means of real wage adjustment. The degree of real adjustment of wages to changes in unemployment, i.e. real wage elasticity, is measured using a simple Phillips curve. Real wage elasticity may be either positive or negative. Negative values suggest that wages are flexible (growth in wage costs is suppressed by growth in unemployment). By contrast, positive or insignificant values of wage elasticity point to the absence of wage flexibility. The Phillips curve estimates were made using the ordinary least squares method (OLS).⁹⁶ Table 34 shows a summary of results.

Table 34: Elasticity of wages to the unemployment rate

	1996–2001	2001–2009
CZ	-0.018 *	-0.005
AT	-0.090 **	-0.003
DE	-	-0.029 *
PT	-0.012	-0.023 *
HU	-0.041 **	-0.030 **
PL	-0.027 *	-0.009
SI	0.001	-0.027 *
SK	-0.032 **	0.009
EU-16	-	-0.011

Note: Owing to a data revision, the estimate was updated for the period 2001–2009. The data for 1996–2001 are taken from the 2008 Alignment Analyses.

Source: CNB calculations.

The estimated wage elasticity for the Czech Republic, like those for Austria, Poland and Slovakia, decreased between the periods under review, becoming statistically insignificant. The estimates for the recent period are statistically significantly different from zero for Germany, Portugal, Hungary and Slovenia. Real wages in the Czech Republic, Austria, Poland and Slovakia are thus not likely to have had a stabilising effect at the macroeconomic level in 2001–2009. However, nominal wages in the Czech Republic have recently shown

⁹⁶ Owing to Eurostat's changeover to a new NACE2 classification, wage cost data for the current analysis are only available since 2001; new estimates were therefore made on quarterly data for 2001Q1–2009Q1. The data for 1996Q1–2001Q1 are taken from the 2008 Alignment Analyses, where the same methodology was used for the calculation.

some signs of flexibility in this area. Nominal wages responded to the buoyant growth and subsequent sharp downturn in the corresponding direction, dampening the impact of the recession on the Czech labour market. The absence of real wage flexibility may be linked with lagged changes in wages and the co-movement of inflation.

2.2.2 Degree of adjustment of regional real wages to the regional unemployment rate (the wage curve)

A supplementary view of wage elasticity is provided by wage curve estimates, which express real wage flexibility in terms of the rate of adjustment of regional wage levels to the level of regional unemployment (Nickell, 1997). The coefficient can theoretically be expected to take negative values. A coefficient close to zero, or even positive, means that the relationship between regional unemployment and wage levels is weak. Blanchflower and Oswald (1994) found that the coefficient of the logarithm of the regional unemployment rate is negative at around -0.1 in a number of advanced and transition countries.

Table 35 for 1994–2008 shows that wage elasticity is cyclically conditional on GDP growth, fluctuating between -0.08 and -0.13 in 1994–2001, except for a cyclically conditional weakening during the 1997–1999 economic recession.⁹⁷ Galuščák and München (2005) interpret cyclically conditional wage elasticity in the context of the theory of efficiency wages (Shapiro and Stiglitz, 1984), finding that wages in the Czech economy are dependent on regional, especially short-term, unemployment.⁹⁸ The decline in wage elasticity since 2000 may have been associated with the marked increase in long-term unemployment in the late 1990s.⁹⁹ Under this method, real wage elasticity did not increase in the period of fast economic growth in 2005–2007 and the subsequent slowdown in 2008.

⁹⁷ The wage curve is estimated on wage data for districts obtained by the workplace and business method. If, for example, a corporation has branches in multiple districts, the data on wages paid in these branches are, in the case of the workplace method, aggregated in the relevant districts and, in the case of the business method, aggregated in the district of the headquarters. Wage data in districts obtained by the workplace method are thus more precise, but the CZSO observed them only until 2001.

⁹⁸ Galuščák and München (2005) estimate the wage curve in 1993–2001.

⁹⁹ Besides long-term unemployment, wage elasticity may be affected by the institutional framework for collective bargaining. For low wages, the factors behind wage flexibility are the minimum wage level and the tax and benefit system (see section 2.3.4).

Table 35: The wage curve in the Czech Republic

	Elasticity of real wages		GDP (%) ^{a)}
	Workplace method	Business method	
1994–1995	-0.10***	-0.10**	4.1
1995–1996	-0.13***	-0.10**	4.9
1996–1997	-0.05	-0.02	1.6
1997–1998	-0.02	0.03	-0.7
1998–1999	-0.06	-0.14	0.3
1999–2000	-0.11***	-0.17*	2.5
2000–2001	-0.08**	-0.09*	3.1
2001–2002		-0.07**	2.2
2002–2003		-0.03	2.7
2003–2004		0.08	4.0
2004–2005		0.06	5.4
2005–2006		0.06	6.6
2006–2007		0.07	6.5
2007–2008		0.04	4.6

Notes: 2SLS estimates; the unemployment rate is instrumented. *, ** and *** denote significance levels of 10%, 5% and 1% respectively.

^{a)} Average annual GDP growth at constant prices in the given period.

Source: Galuščák and Münich (2005) methodology.

2.2.3 Sources of nominal and real wage rigidity (business survey evidence)

The way in which businesses change wages and how often they do so naturally affects their ability to adjust personnel cost to economic conditions. A supplementary view of wage elasticity is thus provided by evidence from a business survey that directly asks businesses how they use the wage freeze/cut method and indexation mechanisms.¹⁰⁰

The **nominal wage freeze/cut** indicator takes values between 0 and 1 and is constructed as the proportion of businesses that have frozen/cut nominal wages over the past five years. Higher values of the wage freeze indicator and lower values of the wage cut indicator can thus indicate a greater downward stickiness of nominal wages.¹⁰¹

The **wage indexation** indicator is constructed similarly, taking values between 0 and 1 and indicating the proportion of businesses in which there is an automatic relationship between nominal wages and past or expected inflation. This relationship would be a source of real wage stickiness.

Table 36 shows that the Czech Republic recorded the highest degree of nominal wage freezing in 2002–2006 (more than one-quarter of the businesses surveyed), while the lowest

¹⁰⁰ Babecký et al. (2008) analyse wage and price setting in the Czech Republic using such data.

¹⁰¹ In Babecký et al. (2009), the response of businesses in the form of a wage freeze rather than a wage decline is assessed as a sign of downward stickiness of wages. However, a wage freeze can be both destabilising and stabilising. If the economic conditions result in a need to reduce nominal wages, a nominal wage freeze can imply the need to adjust through employment. In a different situation, though, a nominal wage freeze amid non-zero (and changing over time) inflation can lead to a decline in real wages and thus to a desirable adjustment to productivity and other macroeconomic variables. A halt in wage growth and an increase in the frequency of wage declines in a period of economic recession can be regarded as a flexible feature.

degree was recorded by Slovenia.¹⁰² Nominal wage indexation was used in 12% of cases in the Czech Republic, i.e. roughly to the same extent as in Austria, Portugal and Hungary.¹⁰³ Of the observed countries, Slovenia had prerequisites for the highest real wage stickiness (24%), while Poland had prerequisites for the lowest real wage stickiness (7%).¹⁰⁴

Table 36: Downward flexibility of nominal and real wages

	Downward nominal wage stickiness		Downward real wage stickiness
	Wage freezing	Wage cutting	Wage indexation
CZ	0.265	0.084	0.117
AT	0.133	0.030	0.098
PT	0.150	0.010	0.090
HU	0.059	0.026	0.112
PL	0.100	0.044	0.069
SI	0.029	0.025	0.235

Note: The proportion of businesses that applied nominal wage freezes/cuts or automatic wage indexation in 2002–2006. Weighted averages (by employment).

Source: Babecký et al. (2009).

Box 3: Responses of firms to the current financial and economic crisis (firm-level survey evidence)

An update of the firm-level survey conducted in June 2009 provides evidence on the main channels of the impact of the crisis on Czech firms and on wage flexibility in a situation of economic crisis. The same firms were contacted in this update as those that participated in the survey described in section 2.2.3. Data for the other countries compared in section 2.2.3 are not yet available.

The update results show that just over half of the firms surveyed have been strongly or very strongly affected by the current crisis in the form of lower demand (see Table 37). Difficulties in financing through the usual financial channels and problems with customer solvency are being felt strongly or very strongly by about one-third of firms. Disproportionately large difficulties are being observed in manufacturing.

Table 38 shows the use of nominal wage freezes and cuts in response to the current crisis and compared to 2002–2006.¹⁰⁵ Two-thirds of firms are responding to the current crisis by freezing wages. This response is significantly more prevalent in manufacturing than in other sectors and more frequent in large corporations. In 2002–2006, just over a quarter of the firms analysed used wage freezes, with no statistically significant differences across sectors and corporation sizes. The nominal wage cut response is less widespread, but as with wage freezes is more frequent than in 2002–2006.¹⁰⁶ A halt in

¹⁰² The results differ slightly from those published in the 2008 Alignment Analyses owing to the use of weighted averages instead of simple averages.

¹⁰³ According to CNB analyses, real wages deflated by headline inflation are generally counter-cyclical in the Czech Republic, i.e. real wages grow more slowly/quickly at times of fast/low economic growth. This relationship is disturbed at some times by the impacts of administrative changes on inflation. However, the counter-cyclical nature of real wages seems to be largely due to fluctuations of the exchange rate, to which economic growth and inflation respond faster than nominal wages. When real wages are deflated by domestic production prices only, they are generally pro-cyclical (i.e. real wages grow faster at the peak of the business cycle and *vice versa*), which suggests some degree of real wage flexibility.

¹⁰⁴ The results should be interpreted in the overall context, as countries with low, stable inflation can be expected to have a higher wage freeze indicator in the long term and a simultaneously lower degree of indexation.

¹⁰⁵ The share of firms that applied wage freezes in 2002–2006 differs slightly from the figure given in section 2.2.3 since the set of firms described in the box is based on firms participating in the additional survey.

¹⁰⁶ Anecdotal evidence suggests that businesses are also employing different ways of reducing labour costs, e.g. a shorter working week.

wage growth and a rise in the frequency of wage cuts during a recession can be regarded as signs of flexibility, although the adjustment in the labour market is happening largely via growth in unemployment. No clear conclusion can be made about wage flexibility in the Czech Republic from the currently available data, since the recent economic developments are extraordinary and it is impossible to make a comprehensive comparison over time and with other countries.

Table 37: Firms strongly or very strongly affected by the financial and economic crisis in individual areas (share of positive responses in %)

	Lower demand for products and/or services	Difficulties in financing through usual financial channels	Customer payment difficulties	Difficulties in obtaining intermediate products from usual suppliers
Total	53	29	36	7
- manufacturing	64	32	38	12
- other sectors ^{a)}	36 ***	25	34	0 ***
- small corporations	35	35	45	3
- medium-sized corporations	53	24	41	1
- large corporations	57 ***	30	32	11 **

Note: ^{a)} Construction, trade, hotels and restaurants, transport and communications, real estate, renting and business activities. Small corporations (20–49 employees), medium-sized corporations (50–199 employees), large corporations (200 or more employees). Differences compared to 2002–2006 statistically significant: *** at the 10% level, ** at the 5% level.

Source: CNB survey.

Table 38: Firms freezing or cutting wages in response to the current crisis and in 2002–2006 (share in %)

	Reaction to current crisis	2002–2006
Wage freezes	66	28
- manufacturing	71	26
- other sectors ^{a)}	57 **	30
- small corporations	45	29
- medium-sized corporations	66	37
- large corporations	70 **	23
Wage cuts	13	9

Note: ^{a)} Construction, trade, hotels and restaurants, transport and communications, real estate, renting and business activities. Small corporations (20–49 employees), medium-sized corporations (50–199 employees), large corporations (200 or more employees). Differences compared to 2002–2006 statistically significant: *** at the 10% level, ** at the 5% level.

Source: CNB survey.

2.2.4 Inflation persistence

The ability of the economy to absorb shocks effectively also depends on price flexibility. One of the ways of examining price flexibility is to analyse inflation persistence (inertia), i.e. the speed at which inflation returns to equilibrium after a shock. It can be said that high inflation persistence signals price inflexibility (Coricelli, Horváth, 2009). Substantial local differences in inflation persistence in the countries of a monetary union can result in different impacts of the single monetary policy. According to Angeloni and Ehrmann (2004), the differences in inflation observed among individual euro area countries can be largely explained by different inflation persistence.

Inflation persistence is measured by three different methods. The first, non-parametric, method (Method 1) uses a procedure proposed by Marques (2004), according to which the longer it takes actual inflation to return to its mean value, the more rigid is the inflation. This

indicator takes values between 0 and 1. The closer the values are to one, the more persistent is inflation.

The second and third methods are based on a model of inflation as an autoregressive process, monitoring the sum of the coefficients of the autoregressive terms. Method 2 assumes a constant mean value of inflation. Marques (2004) and Cecchetti and Debelle (2006) showed that the results of modelling inflation persistence are largely dependent on the assumption regarding the mean to which inflation converges. If the inflation time series contains structural changes or breaks in trend which the model process does not allow for, the inflation persistence estimate is typically biased upwards. Because of the transformation process, accompanied by disinflation, price convergence, gradual price deregulation and changes in monetary policy regime, it is the time series of transition countries that are most affected by breaks in the mean values of inflation. Method 3 therefore models the autoregressive process with the assumption that the mean value of inflation changes over time. The values of persistence indicators in Methods 2 and 3 increase with inflation persistence.

Table 39 summarises the inflation persistence estimates for 1997Q1–2009Q2. Under Method 1, inflation persistence in the Czech Republic exhibits the same levels as in the 2008 assessment and is among the lowest of the other countries surveyed. Similarly, the estimates under Methods 2 and 3 indicate a medium to low level of inflation persistence in the Czech Republic, with negligible differences compared to the 2008 estimates.¹⁰⁷ By contrast, the estimates under Methods 2 and 3 for Austria and Germany show a considerable decline in inflation persistence compared to last year's analysis. This decline is a result of a significant fall in inflation in the last four quarters following a previous increase.

Table 39: Inflation persistence estimates

	Method 1	Method 2	Method 3
CZ	0.79	0.82	0.32
AT	0.79	0.62	0.29
DE	0.77	0.63	0.35
PT	0.81	0.86	0.32
HU	0.84	0.92	0.84
PL	0.81	0.96	0.49
SI	0.88	0.99	0.52
SK	0.81	0.88	0.41

Notes: Method 1 – non-parametric technique.
 Method 2 – sum of autoregression coefficients, constant mean assumed.
 Method 3 – sum of autoregression coefficients, time-varying mean assumed.

Sources: Eurostat, CNB calculations.

¹⁰⁷ As Method 3 best reflects the transition nature of the Czech economy, it can be assigned the greatest weight when interpreting the results.

2.3 Labour market flexibility

Labour market adjustment is a significant equilibrating process. Like wage and price adjustment, it will increase in importance after euro area entry. Wage adjustment or changes in employment and its structure may dampen the negative impacts of asymmetric shocks on the labour market. Labour market flexibility is defined by labour force flexibility and institutional factors.

2.3.1 Unemployment and internal labour market flexibility

An insufficiently flexible labour market is generally associated with higher long-term unemployment and significant regional differences in the unemployment rate. While long-term unemployment suggests a high structural component of unemployment, regional differences in unemployment may be due to low regional mobility of labour.

Table 40 illustrates the evolution of the **long-term unemployment** rate in the countries under review. In the late 1990s, this indicator increased substantially in the Czech Republic, hovering at around 4% until 2006. The long-term unemployment rate declined over the last two years of the period under review, to 2.2% in 2008. This indicator is still higher than in Austria (the lowest level of the countries under comparison) and Slovenia. The long-term unemployment rate is higher in the other countries under comparison than in the Czech Republic. Slovakia has the highest level. The long-term unemployment rate has also been declining in recent years in all the countries under review except Hungary and Portugal. The share of the long-term unemployed in total unemployment (see Table 41) in the Czech Republic was above 50% in previous years and fell slightly to 49% in 2008. It was thus one of the higher shares in the countries under review – comparable levels are only recorded by Germany, Hungary and Portugal, while Slovakia has the highest share of long-term unemployment.¹⁰⁸

Table 40: Long-term unemployment rate (%)

	1998	2002	2003	2004	2005	2006	2007	2008
CZ	2.0	3.7	3.8	4.2	4.2	3.9	2.8	2.2
AT	1.3	1.1	1.1	1.4	1.3	1.3	1.2	0.9
DE	4.7	4.0	4.6	5.5	5.7	5.5	4.7	3.8
PT	2.2	1.8	2.2	3.0	3.7	3.9	3.8	3.7
HU	4.2	2.5	2.4	2.7	3.2	3.4	3.4	3.6
PL	4.7	10.9	11.0	10.3	10.3	7.8	4.9	2.4
SI	3.3	3.5	3.5	3.2	3.1	2.9	2.2	1.9
SK	6.5	12.2	11.4	11.8	11.7	10.2	8.3	6.6

Note: Shares of persons unemployed for 12 months or more under ILO methodology in the labour force.

Source: Eurostat.

¹⁰⁸ All the countries under review are experiencing rising unemployment owing to the current financial and economic crisis. This will be reflected in a lagged increase in long-term unemployment in these countries roughly in 2009–2010.

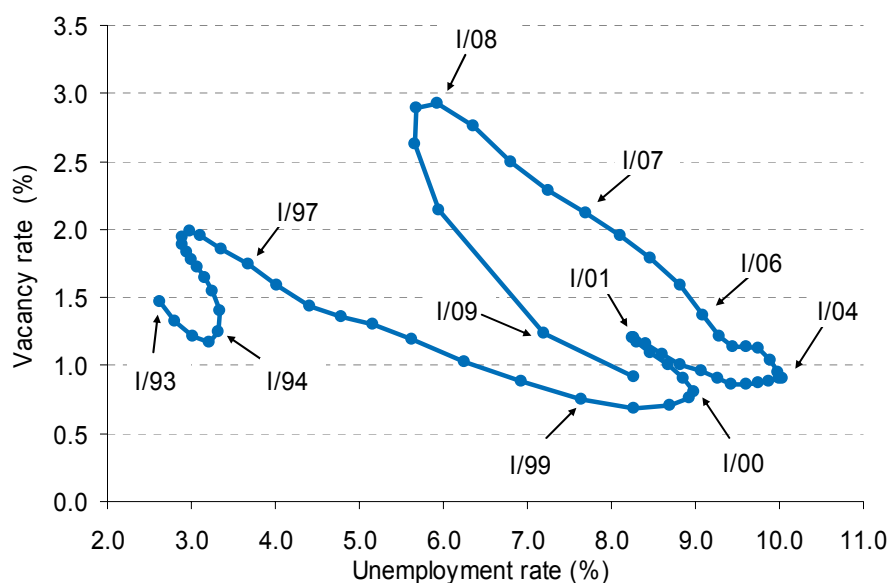
Table 41: Share of the long-term unemployed in total unemployment (%)

	1998	2002	2003	2004	2005	2006	2007	2008
CZ	31	50	49	51	53	54	52	49
AT	30	27	26	28	25	27	27	24
DE	51	48	50	56	53	56	57	53
PT	43	35	35	44	48	50	47	47
HU	50	43	41	44	45	45	47	47
PL	47	55	56	54	58	56	51	34
SI	45	56	53	52	47	49	46	42
SK	52	65	65	65	72	76	74	70

Note: Shares of the long-term unemployed (12 months or more) in all the unemployed under ILO methodology.

Source: Eurostat.

Cyclical and **structural unemployment** can be differentiated by means of the Beveridge curve and with the aid of the aggregate fixed effects of the matching function. The Beveridge curve expresses the dependence between vacancies and unemployment. Decreasing (increasing) unemployment amid a rising (falling) number of vacancies is associated with changes in the cyclical component of unemployment, whereas simultaneous movements of unemployment and vacancies in the same direction signal changes in structural unemployment. The Beveridge curve for the Czech Republic (see Chart 39) shows that cyclical unemployment was decreasing as from around mid-2004, with the rate of decline of cyclical unemployment increasing since 2006. This reflected growing demand for labour in the growth phase of the business cycle. Cyclical unemployment has been increasing since around mid-2008 owing to the cooling of the economy. It is also clear that the labour market in the Czech Republic suffered from the phenomenon of hysteresis, where a period of economic recession is accompanied by a rise in structural unemployment, manifesting itself in an increase in long-term unemployment. This occurred, for example, in 1999–2000 and 2003–2004. The increase in long-term unemployment in these periods is apparent in the data given in Table 40 and Table 41.

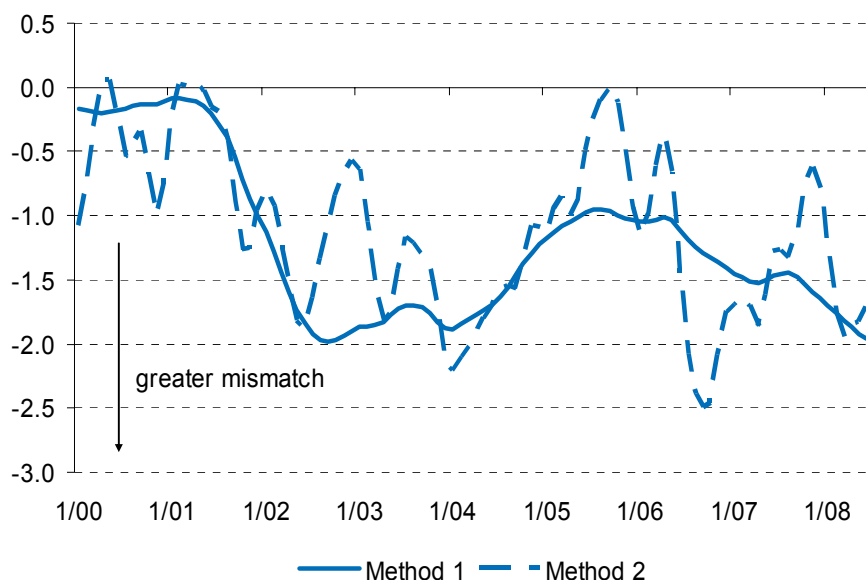
Chart 39: Beveridge curve

Note: Seasonally adjusted quarterly data.

Sources: Ministry of Labour and Social Affairs, CNB calculations.

The recently observed cyclical movement along the Beveridge curve reflects slower adjustment of unemployment to the extraordinarily sharp fall in vacancies. The aggregate fixed effects of the matching function (see Chart 40), which expresses the mismatch in the filling of vacancies by the unemployed, does not show any improvement in the structural mismatch in 2008, hence the structural component of unemployment did not decrease in 2008.

Chart 40: Aggregate fixed effects of the matching function (January 2000 – June 2009)



Note: Smoothed aggregate fixed effects based on two matching function estimation methods. The x-axis gives the beginning of the 13-month period. The two estimation methods differ in the set of instruments used for the estimation. More negative values imply worse mismatch in the filling of vacancies by the unemployed.

Source: CNB calculations according to Galuščák and Münich (2007).

Regional differences in unemployment can be quantified using the coefficient of variation of the unemployment rate for areas (NUTS 2) and regions (NUTS 3). Table 42 shows that the regional differences in the unemployment rate across areas in 2007 were slightly lower than in Austria and Germany but higher than in Portugal and Poland. The differences across regions were lower in the Czech Republic in 2007 than in the other countries under comparison except Portugal and probably Poland. The regional differences in the unemployment rate declined slightly compared to 2006, but rose again in 2008.

Table 42: Coefficient of variation of the unemployment rate (%)

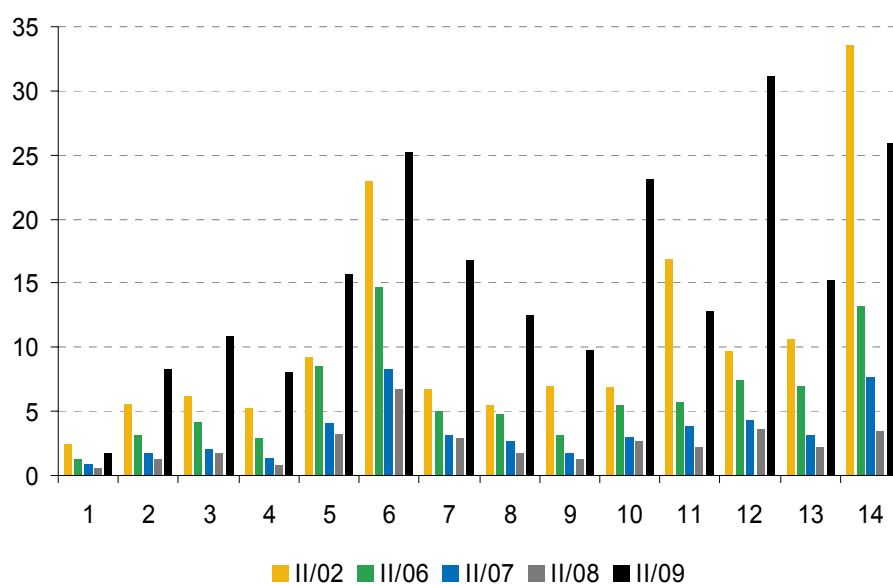
	NUTS 2 regions								NUTS 3 regions							
	1999	2002	2003	2004	2005	2006	2007	2008	1999	2002	2003	2004	2005	2006	2007	2008
CZ	33	44	42	42	46	45	42	44	42	52	45	44	47	46	43	45
AT	29	43	42	41	40	44	45	-	31	44	43	42	41	45	46	-
DE	42	55	46	45	40	39	44	-	-	58	50	49	45	44	50	-
PT	31	31	30	25	22	21	20	-	37	36	35	33	30	29	27	-
HU	35	32	33	28	27	32	39	-	37	36	37	32	30	36	45	-
PL	23	17	16	16	15	12	14	-	38	29	28	26	25	24	-	-
SK	27	23	27	31	37	38	38	-	31	31	36	37	42	43	46	-

Note: The coefficient of variation is the ratio of the standard deviation weighted by region size to the average unemployment rate (%). Labour Force Survey data. The coefficients of variation depend on the degree of disaggregation.

Sources: Eurostat, CNB calculations for CZ 2008.

One of the reasons for the relatively large regional differences in unemployment in the Czech Republic is the gap between households' supply of labour and businesses' demand for labour. This gap can be expressed by the differences in the **number of unemployed persons per vacancy in regions and by profession**. Chart 41 shows that the differences in the number of unemployed persons per vacancy across regions are large. The highest figures are recorded in the Moravia-Silesia region and in the Ústí region, although the differences were narrowing until 2008. Owing to the economic crisis, the indicator has risen significantly this year in all the regions, and most of all in the Olomouc, Moravia-Silesia, Ústí and Vysočina regions. A large gap between the demand for and supply of labour is also apparent in some professions (see Chart 42). Jobs are especially hard to find for persons employed in elementary occupations, clerks and service workers, and shop and market sales workers. The current crisis is reflected in a rising number of unemployed persons per vacancy in all professions, and most of all among clerks and service workers, and shop and trade sales workers.¹⁰⁹

Chart 41: Number of unemployed persons per vacancy in regions

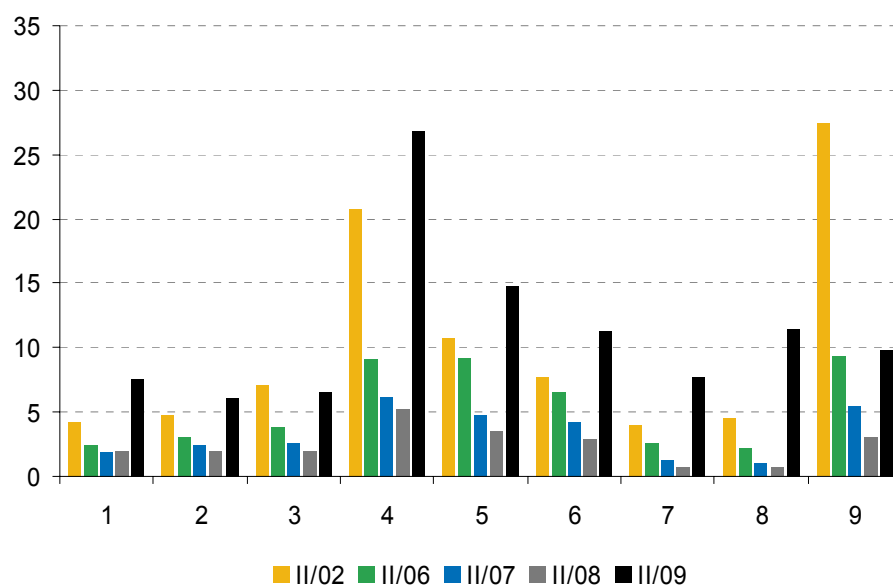


Note: 1 – Prague; 2 – Central Bohemia; 3 – South Bohemia; 4 – Plzeň; 5 – Karlovy Vary; 6 – Ústí; 7 – Liberec; 8 – Hradec Králové; 9 – Pardubice; 10 – Vysočina; 11 – South Moravia; 12 – Olomouc; 13 – Zlín; 14 – Moravia-Silesia.

Sources: Ministry of Labour and Social Affairs, CNB calculations.

¹⁰⁹ In 2009 Q2, extraordinarily high figures for the number of unemployed persons per vacancy (exceeding or approaching 100) were recorded in elementary occupations, for skilled agricultural and forestry workers and clerks. The Ústí, Moravia-Silesia, Liberec and Olomouc regions are hardest hit by this trend. The average value for the Czech Republic is roughly 11 unemployed persons per vacancy.

Chart 42: Number of unemployed persons per vacancy by profession



Note: 1 – Legislators, senior officials and managers; 2 – Professionals; 3 – Technicians and associate professionals; 4 – Clerks; 5 – Service workers and shop and market sales workers; 6 – Skilled agricultural and forestry workers; 7 – Craft and related trades workers; 8 – Plant and machine operators and assemblers; 9 – Elementary occupations.

Sources: Ministry of Labour and Social Affairs, CNB calculations.

The large regional differences in unemployment in the Czech Republic may be due to low regional mobility. Although **internal mobility** (see Table 43) is greater in the Czech Republic than in Poland, Slovenia and Slovakia, it is lower than in Austria and Germany. This indicator is slightly higher for the Czech Republic in 2007 and 2008 than in the previous period.

Table 43: Internal migration (per 1,000 inhabitants)

	1999	2002	2003	2004	2005	2006	2007	2008
CZ	20	22	21	21	21	22	25	24
AT	33	43	44	35	35	36	37	-
DE	48	47	46	45	44	43	-	-
HU	21	23	24	22	22	25	25	-
PL	11	11	11	11	11	12	13	-
SI	15	17	14	15	16	19	-	-
SK	15	17	16	16	16	17	17	-

Note: Changes in permanent residence; SI – Slovenian nationals only.

Sources: Eurostat, statistical yearbooks, CNB calculations.

2.3.2 Structural unemployment

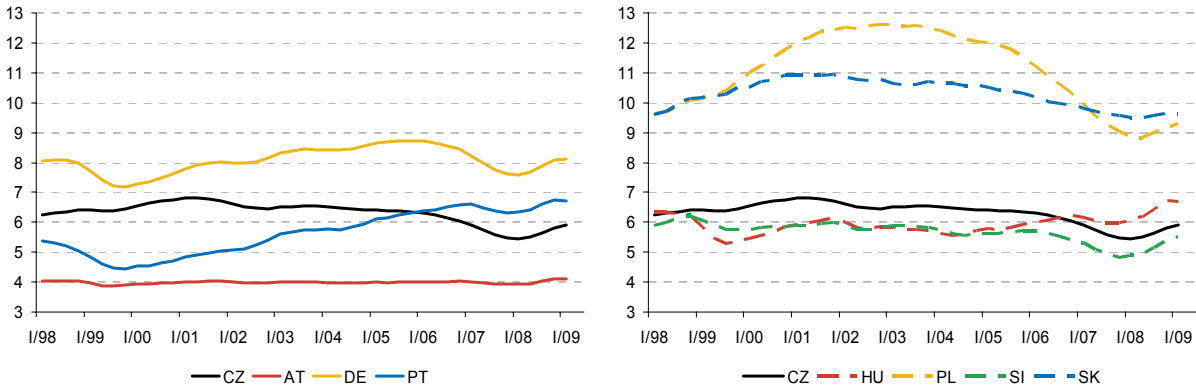
Structural unemployment in the economy is a sign of labour market inflexibility, hindering the smooth two-way transition of economically active persons between employment and unemployment. This type of unemployment shows up, for example, in regional differences in unemployment or skills mismatches between unemployed persons and vacancies. It is not linked with the business cycle, but rather has long-term causes in the institutional settings of the labour market and is associated with the interconnection between the education system and the needs of business practice and with the parameters of national social policy.

Changes in structural unemployment are usually estimated by means of changes in the NAIRU, i.e. the unemployment rate consistent with stable inflation, which abstracts from

unemployment due to cyclical effects.¹¹⁰ However, this economic variable is not directly observable. It is estimated by filtering time series using an economic model (for details see the *Methodological Part*). A low or falling NAIRU signals a positive trend in labour market flexibility, while a high or rising NAIRU is an adverse phenomenon.

Chart 43 shows a comparison of the NAIRUs in the countries under review. According to the estimate, the NAIRU in the Czech Republic fluctuated just above 6% in the time period under review and dipped temporarily below this level in 2008. It is currently among the lower ones in the selected sample, roughly comparable to that in Slovenia. Austria, which has a low unemployment rate with only small fluctuations, has a significantly lower NAIRU. The NAIRUs in Hungary and Portugal have been rising in recent years and are now slightly above that in the Czech Republic. The NAIRUs in Germany and Poland have been rising in recent years and are now slightly above that in the Czech Republic. The NAIRU is relatively high in Germany and even higher in Slovakia and Poland, where the unemployment rate was much higher than in the other countries under review in the first half of this decade. However, the NAIRU in Poland has decreased considerably over the last two years.

Chart 43: The NAIRU



Sources: Eurostat, CNB calculations.

The estimated NAIRU suggests that the Czech labour market might have seen a slight structural improvement since 2006, although this halted in mid-2008.¹¹¹ An increase in the NAIRU has recently been observed in all the countries under comparison except Austria.

2.3.3 International labour mobility

International labour mobility within a currency area can be an important channel for the economy’s ability to absorb asymmetric shocks, in particular those of a long-term nature, through changes in labour supply.¹¹²

¹¹⁰ The traditional NAIRU concept was created by Milton Friedman (1968). NAIRU stands for the Non-Accelerating Inflation Rate of Unemployment. Unemployment is defined according to the ILO.

¹¹¹ The magnitude of the decline in the NAIRU in 2006 and 2007 is roughly the same as the width of the 95% confidence interval of the point estimate. Gianella et al. (2008), for example, find relatively wide confidence intervals of NAIRU point estimates for 23 OECD countries. Short-term movements in this indicator should therefore be taken with a pinch of salt.

¹¹² See, for example, Mundell (1961) or McKinnon (1963).

2.3.3.1 Migration abroad

The degree of international mobility can be assessed by means of the number of immigrants and emigrants (see Table 44).¹¹³ The data on recorded mobility show that the **number of immigrants** to the Czech Republic rose continuously until 2007, then fell in 2008. In 2007, it was higher than in Germany, Portugal, Hungary, Poland and Slovakia. Compared to the Czech Republic, international mobility as expressed by the number of immigrants was higher only in Austria and Slovenia in this period. The increase in the number of immigrants to the Czech Republic since 2005 seems to have been due mainly to demand for labour, as the **number of emigrants** from the Czech Republic declined sharply in 2007, unlike the number of immigrants. In 2007, the number of emigrants from the Czech Republic was lower than in Austria, Germany, Portugal and Slovenia. The number declined further in 2008.

Table 44: Immigration and emigration (number of persons per 10,000 inhabitants)

	Immigration				Emigration			
	2001	2006	2007	2008	2001	2006	2007	2008
CZ	13	66	101	75	21	33	20	6
AT	112	122	129	-	90	89	89	-
DE	107	80	83	-	74	78	77	-
PT	18	26	44	-		12	25	-
HU	21	21	24	-	3	4	4	-
PL	2	3	4	-	6	12	9	-
SI	39	100	145	-	24	69	74	-
SK	4	23	30	-	2	6	7	-

Sources: Eurostat, CZSO, statistical yearbooks, CNB calculations.

International mobility is also evidenced by the data on the **proportion of foreigners in the population** (see Table 45). The share of foreigners in the population in the Czech Republic is similar to that in Slovenia and higher than that in Hungary, Poland and Slovakia. Austria and Germany have considerably higher shares of foreigners in their populations. Compared to previous years, there has been an increase in the share of foreigners in the population and in the labour force in the Czech Republic since 2006, owing to significant increases in the number of employed foreigners.

Table 45: Share of foreign nationals in the population (%)

	1998	2002	2003	2004	2005	2006	2007	2008
CZ	2.0	1.6	1.8	1.9	1.9	2.5	2.9	3.3
AT	9.3	9.1	9.3	9.4	9.6	9.8	10.0	10.3
DE	9.0	8.9	8.9	8.9	8.8	8.8	8.8	8.8
PT	1.7	2.2	2.3	-	-	2.6	4.1	4.2
HU	1.4	1.1	1.1	1.3	1.4	1.5	1.7	1.8
PL	-	1.8	-	-	-	0.1	0.1	0.2
SI	2.1	-	2.2	2.3	2.2	2.4	2.7	3.4
SK	-	-	0.6	0.6	0.4	0.5	0.6	0.1

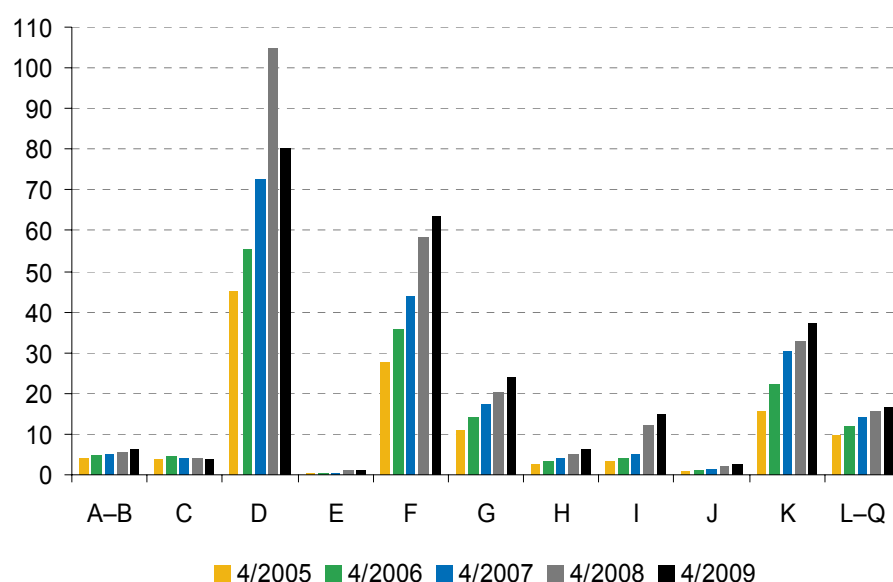
Sources: Eurostat, CNB calculations.

¹¹³ The data shown in Table 44 may be underestimated since they only refer to registered individuals. A substantially higher true number of emigrants can probably be assumed in the case of Poland in particular.

At the end of April 2009, 256,300 foreign workers were registered in the Czech Republic.¹¹⁴ Most of these were Slovaks (36%), followed by Ukrainians (30%) and Poles (7%).¹¹⁵ The number of foreign workers had been increasing very rapidly since about the beginning of 2005, with 43,800, 33,300 and 55,200 newcomers recorded in 2005, 2006 and 2007 respectively. In 2008, the number of foreign workers decreased by 6,400 as a result of lower labour demand. The main factor of foreign employment in the Czech Republic is demand for labour. Accession to the EU in 2004 and the related relaxation of conditions for foreign employees had only a limited effect.¹¹⁶

Foreign workers are employed in the Czech Republic mainly in manufacturing, construction, real estate and renting, and wholesale and retail trade (see Chart 44). These industries were reporting the highest growth in the number of foreign workers. In 2008 and the first few months of 2009, the number of foreign workers in manufacturing declined significantly owing to lower demand for labour. Most other sectors continued to show slight growth.

Chart 44: Foreign employees in the Czech Republic by industry (thousands of persons)



Note: A-B – Agriculture, forestry; C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply; F – Construction; G – Wholesale and retail trade; H – Hotels and restaurants; I – Transport; J – Financial intermediation; K – Real estate; L-Q – Other services.

Source: Ministry of Labour and Social Affairs.

Foreign workers find employment in jobs requiring lower skills (see Chart 45), the largest increases in 2008 being recorded for workers in elementary occupations. In 2008 and during

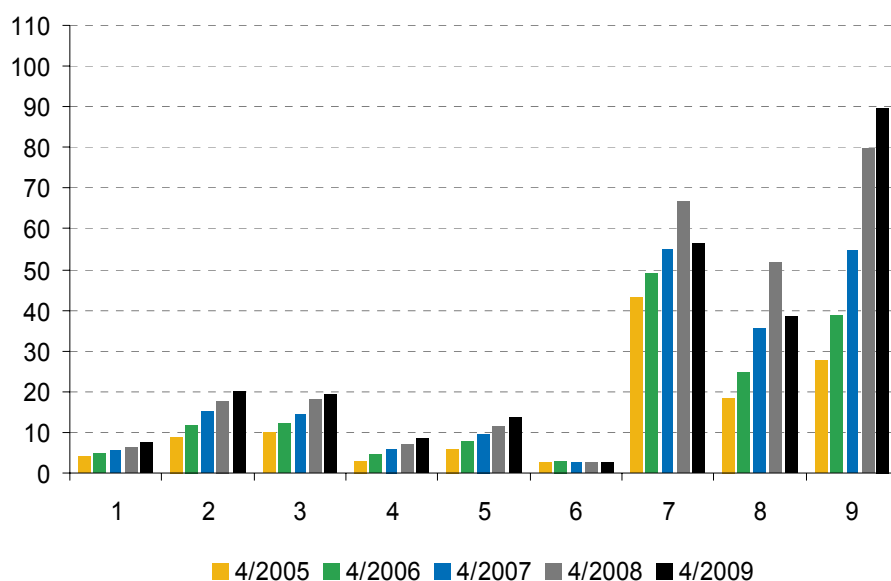
¹¹⁴ Data from labour offices on the numbers of workers subject to the recording obligation and on the numbers of workers who require a work permit.

¹¹⁵ The share of Slovaks in foreign employment in the Czech Republic is declining, while the share of nationals of other states is increasing.

¹¹⁶ Since May 2004, EU nationals have been able to work in the Czech Republic without restrictions (Slovak nationals did not require a work permit even prior to EU accession). However, the numbers of foreign workers began to increase more significantly only in 2005. The numbers of foreign workers in the Czech Republic since 1996, when data on foreign employment began to be available, correlate very closely with economic activity as measured by GDP growth. The extraordinary increase in foreign workers in 2005–2007 was probably related primarily to the high GDP growth and a related increase in demand for labour. This has reversed recently as a result of the decline in economic activity.

2009, the number of foreign workers employed as plant and machine operators and craft and related trades workers recorded a decline.¹¹⁷

Chart 45: Foreign employees in the Czech Republic by profession (thousands of persons)



Note: 1 – Legislators, senior officials and managers; 2 – Professionals; 3 – Technicians and associate professionals; 4 – Clerks; 5 – Service workers and shop and market sales workers; 6 – Skilled agricultural and forestry workers; 7 – Craft and related trades workers; 8 – Plant and machine operators and assemblers; 9 – Elementary occupations.

Source: Ministry of Labour and Social Affairs.

To sum up, then, according to the data on recorded mobility, international mobility in the Czech Republic is lower than in Austria and Slovenia. It is also lower than in Germany and Portugal in terms of the number of emigrants.¹¹⁸ The high growth in foreign employment in the Czech Republic from 2005 until the second half of 2008 was due to increasing demand for labour and can be viewed as evidence of an ability to adjust. Similarly, the decline in the number of foreign workers which began as a result of the current sharp fall in economic activity can be regarded as an adjustment channel. However, the previous inflow of workers from abroad was probably linked with the other rigidities on the Czech labour market, causing demand for labour of workers with lower skills not to be met from domestic sources (see section 2.3.1).¹¹⁹ Moreover, the mobility of the foreign labour force may itself pose some risk to the supply of labour in a country, as movements of foreign workers are affected by other factors in addition to demand in the host country (potential earnings, language barriers, geographical distance, conditions in other countries, etc.). Unexpected changes in foreign employment flows may thus occur despite unchanged domestic conditions.

¹¹⁷ Lower-skill jobs are largely filled by Ukrainian nationals. Slovaks, in addition to these jobs, find employment in skilled jobs, presumably due to the lack of a language barrier.

¹¹⁸ According to MLSA (2008), however, the number of Czech nationals working in EU/EEA countries and Switzerland more than doubled in 2005–2007. According to the available data, 76,400 Czech nationals were working in 20 European countries in 2007.

¹¹⁹ Foreign workers are often hired through employment agencies. Hiring workers through employment agencies is more flexible for employers than direct employment, since employees of employment agencies are not subject to the prohibition of repetition of fixed-term contracts.

2.3.3.2 Administrative restrictions on international labour mobility

The free movement of persons, including workers, is one of the four fundamental economic freedoms enshrined in the EU Treaty (Articles 39 to 42). However, during the negotiations on EU enlargement on 1 May 2004, most of the old Member States adopted **transitional restrictions on the free movement of workers from the new countries**. These transitional restrictions are stipulated in Annex V to the Act of Accession. Their adoption gives the new Member States the right to apply reciprocal measures. However, this right has not been exercised by the Czech Republic.¹²⁰

Of the twelve old euro area countries, only Ireland opened its labour market to workers from the new Member States as of 1 May 2004. Other euro area countries exercised the right to apply a transition period, during which a work permit was necessary to employ workers from the new Member States under review. During 2006, the above transition period was cancelled in Finland, Italy, Portugal, Greece and Spain, and the labour markets in Belgium, France and the Netherlands were partially liberalised the same year. All restrictions were subsequently lifted in the Netherlands on 1 May 2007. Luxembourg has not applied the transition period since 1 November 2007, while France cancelled its transition period on 1 July 2008 (although the restrictions still apply to Bulgaria and Romania). Belgium cancelled its transition period on 1 May 2009. Only Germany and Austria currently apply the transition period to workers from the Czech Republic. None of the new Member States that have joined the euro area applies restrictions to workers from the countries under review or the other euro area countries. The specific measures of the countries under comparison that currently still apply the transition period are given in detail in Table 46. If serious labour market disturbances occur, these specific measures may be applied until the end of a seven-year period after accession. As of 1 May 2011, all EU Member States must introduce free movement of labour for all citizens of the countries which acceded to the EU on 1 May 2004. Given that the Czech Republic cannot realistically adopt the euro until after 2011, the relevance of these administrative restrictions to labour mobility for the period after euro adoption disappears.

Table 46: Persisting administrative barriers for the new EU members

Country	Current situation	Outlook
Austria	A transition period applies until 30 April 2010 to workers from the new Member States under review. A quota known as the “Bundeshöchstzahl” is set in Austria, stipulating that the percentage of foreigners employed may not exceed 8% of the entire Austrian labour force. The individual federal states then set quotas known as “Landeshöchstzahlen” A list of professions for which access to the labour market has been simplified was issued on 1 January 2008.	Austria has notified the European Commission of its intent to keep the transition period until 30 April 2010.
Germany	A transition period applies until 30 April 2010 to workers from the new Member States under review. The situation of job applicants from the Czech Republic and Slovakia is facilitated somewhat by the bilateral agreements which have been concluded. These include an agreement on procedures relating to employment in Germany for a period of up to three months during one year, an	Germany has notified the European Commission of its intent to keep the transition period until 30 April 2010. However, it is being partially liberalised.

¹²⁰ The position of the Czech government is included in its resolution No. 13 of 7 January 2004.

agreement on mutual employment of Czech, Slovak and German citizens for the purpose of extending their professional and language skills, and an agreement on the secondment of Czech and Slovak workers from companies with registered offices in the Czech and Slovak Republics on the basis of work performance contracts. As from 1 November 2007, a simplified procedure is applied to the issuance of work permits for some professions and German school leavers. On 1 January 2009, the procedure for issuing work permits to university graduates in general was also simplified.

Hungary A transition period applies to those euro area countries which apply such a period themselves.

Source: Ministry of Labour and Social Affairs.

2.3.4 Institutional environment

The institutional environment has a fundamental influence on the labour market. Economic adjustment may be limited by the relationship between wages and labour productivity, strict employment protection measures, or a social system which fails to sufficiently motivate unemployed people to seek jobs.

2.3.4.1 Trade unions and collective bargaining

In the economy, wages represent information about the cost of labour, which influences the allocation of production resources. Wage-setting at the company level with regard to corporate labour productivity is an important prerequisite for wage flexibility. If industry-level (generally higher-level) collective bargaining plays a significant role, it may weaken the link to labour productivity and lead to a higher wage level and higher unemployment (Calmfors and Driffill, 1988).¹²¹ If industry-level bargaining predominates, it may result in lower wage flexibility. The negative impact of industry-level bargaining can be intensified by regulations extending the binding effect of collective pay agreements beyond the contractual parties (Brandt, Burniaux and Duval, 2005).

Coverage of employees by collective agreements amounts to 51% in the Czech Republic.¹²² It is slightly higher in manufacturing (56%), while standing at 39% in trade (see Table 47). Collective bargaining coverage in the Czech Republic is higher than in Hungary and Poland, and is around 10 percentage points lower than in Germany. Full, or almost full, coverage of employees by collective agreements is recorded in Austria and Slovenia.

The practice of extending the binding effect of higher-level collective agreements is not applied very widely in the Czech Republic. An analysis of Labour Force Survey data reveals that extended higher-level collective agreements do not cover significantly more than 10% of employees (as of August 2008). In 2009, the extension of the binding effect of higher-level

¹²¹ While some studies confirm this hypothesis, Flanagan (1999) argues that in the case of an open economy, a high degree of economic integration or a large non-trade union organised sector, the given macroeconomic variables can be more or less independent of the collective bargaining structure.

¹²² Independent estimates of the degree of coverage in the Czech Republic provide similar figures. According to an estimate by Trexima, the collective agreement coverage in businesses of the whole business sector with ten employees or more amounted to 53% in 2007 (data from the Average Earnings Information System).

collective agreements applies only to the textile and clothing and leather-processing sectors and to road transport (as of July 2009).¹²³

Table 47: Coverage of employees by collective agreements in 2006 (%)

	CZ	AT	DE	PT	HU	PL	SI
Total	51	98	62	97	45	27	100
- manufacturing	56	99	63	96	46	28	100
- construction	49	98	-	97	39	24	100
- trade	39	100	-	97	44	16	100
- market services	49	94	61	98	43	33	100

Note: Coverage by corporate or higher-level collective agreements in businesses with 20 employees or more. Weighted estimates for manufacturing, construction, trade and market services excluding financial intermediation. The total figures are for the sectors listed in the table (DE: only manufacturing and market services excluding financial intermediation).

Source: CNB calculations from the ECB's harmonised survey.

Wage flexibility in the Czech Republic is thus not limited by collective bargaining more than in the existing euro area Member States. However, in the non-business sector, wages are set at the central level with a weak link to labour productivity.

2.3.4.2 Minimum wage

The administrative setting of a minimum wage reduces wage differentiation and wage flexibility at the low end of the wage scale. If the minimum wage is too high, it may reduce demand for less-skilled labour and for graduates and thereby increase the total and long-term unemployment of people with low skills and unemployment among graduates and school-leavers (OECD, 1998; Gregg, 2000).

In the Czech Republic, the **minimum wage** as a percentage of the average wage was relatively low in the 1990s. This indicator rose continuously between 1999 and 2006, then declined to 38.1% in 2007 (see Table 48).¹²⁴ The minimum wage as a percentage of the average wage in the Czech Republic is higher than in Hungary and Poland, but lower than in Portugal, Slovenia and Slovakia.¹²⁵ As in the Czech Republic, this indicator declined somewhat in Hungary compared to 2006. By contrast, it rose significantly in Slovakia.

¹²³ Provisions regarding the extension of the binding effect of higher-level collective agreements are included in the Collective Bargaining Act. The legislation in force since July 2005 defines all employers in the given sector to which the binding effect of collective agreements should be extended. The extension of the binding effect of higher-level agreements does not apply to businesses employing less than 20 people, businesses employing more than 50% disabled people or businesses subject to another higher-level collective agreement.

¹²⁴ This ratio probably declined further in 2008 and 2009, since the minimum wage remains the same as in 2007 (CZK 8,000).

¹²⁵ No minimum wage has been defined at the national level in Germany. In January 2009, Austria introduced an across-the-board minimum wage of EUR 1,000, which represents about 44% of the average wage.

Table 48: Minimum wage (% of the average wage)

	2002	2003	2004	2005	2006	2007
CZ	36.9	38.1	38.4	39.1	39.7	38.1
PT	43.0	40.7	40.0	40.5	40.7	41.6
HU	42.1	38.6	40.7	38.2	39.6	36.5
PL	33.0	33.9	35.1	33.7	36.1	-
SI	45.3	46.3	44.1	45.6	46.6	43.9
SK	32.4	34.0	34.1	34.4	34.8	46.6

Note: Monthly minimum wage as a percentage of the average wage in industry and services (excluding public administration).

Source: Eurostat.

The minimum wage's negative impact on wage flexibility can be more pronounced in some sectors and professions. The minimum wage as a percentage of the wage in the first decile of the wage distribution is high in low-skilled professions (see Table 49). This relation indicates that for 10% of persons employed as service and shop and market sales workers and in elementary occupations, the minimum wage made up more than 80% of their earnings in 2008. However, a decline in the minimum wage ratio compared to the previous year can be observed here as well.

Table 49: Minimum wage and gross monthly wage in selected professions (%)

Main employment class	Minimum wage / 1 st decile					
	2003	2004	2005	2006	2007	2008
Total for the Czech Republic – business sector	63.9	66.1	68.0	69.6	66.6	62.9
- services and shop workers	87.6	89.2	90.1	89.8	86.8	83.4
- skilled agricultural and fishery workers	74.4	74.3	76.3	75.0	69.6	69.3
- elementary occupations	84.3	86.3	89.1	90.1	89.5	87.4

Note: The table only lists the three professions with the highest figures in 2008.

Sources: Average Earnings Information System (Ministry of Labour and Social Affairs), CNB calculations.

2.3.4.3 Employment protection

Strict **conditions for the recruitment and dismissal of employees** reduce flows on the labour market and increase long-term unemployment (OECD, 2004).¹²⁶ The high costs of dismissing individual employees (in particular during the period shortly after conclusion of the employment contract, once the probationary period has expired) result in lower job creation, especially for graduates and young people. The combination of the high costs of dismissing permanent employees and low regulation of temporary work strengthens the position of permanent employees relative to temporary workers, whose chance of gaining permanent employment is thus lower.

According to OECD data, the conditions for the dismissal of individual employees were stricter in the Czech Republic in 2008 than in the countries under comparison except for

¹²⁶ Bassanini and Duval (2006) confirm the conclusions of other papers that employment protection, as measured by the EPL index (Employment Protection Legislation; see Table 50), has no clear impact on the overall employment rate. Higher EPL values, however, adversely affect the entry of young people onto the labour market. A higher EPL index, according to these authors, is also associated with substitution of part-time contracts with full-time contracts for women.

Portugal and Slovenia (see Table 50).¹²⁷ In the Czech Republic, the cost of dismissing employees is relatively high, especially with regard to short-term contracts (see Chart 46).¹²⁸ This institutional set-up may adversely affect job creation and long-term unemployment in the Czech Republic.

Table 50: Employment protection legislation (EPL) index^{a)}

	Permanent employment ^{b)}			Temporary employment ^{c)}			Collective dismissals ^{d)}			Overall index ^{e)}		
	2003	2006	2008	2003	2006	2008	2003	2006	2008	2003	2006	2008
CZ	3.3	3.3	3.1	0.5	0.9	0.9	2.1	2.1	2.1	1.9	2.1	2.0
AT	2.4	2.4	2.4	1.5	1.5	1.5	3.3	3.3	3.3	2.2	2.2	2.2
DE	2.7	3.0	3.0	1.5	1.3	1.3	3.8	3.8	3.8	2.4	2.4	2.4
PT	4.3	4.2	4.2	3.0	2.8	2.1	2.9	2.9	1.9	3.5	3.4	2.9
HU	1.9	1.9	1.9	1.1	1.1	1.4	2.9	2.9	2.9	1.8	1.8	1.9
PL	2.1	2.1	2.1	1.3	1.8	1.8	4.1	3.6	3.6	2.1	2.2	2.2
SI	-	-	3.2	-	-	1.9	-	-	2.9	-	-	2.6
SK	2.3	2.3	2.5	0.4	0.4	0.4	3.8	3.8	3.8	1.7	1.7	1.8

Notes: ^{a)} The indices take values ranging from 1 to 6, a higher value meaning greater employment protection.

^{b)} Protection against individual dismissal.

^{c)} Fixed-term contracts, temporary work agencies.

^{d)} Over and above individual dismissals.

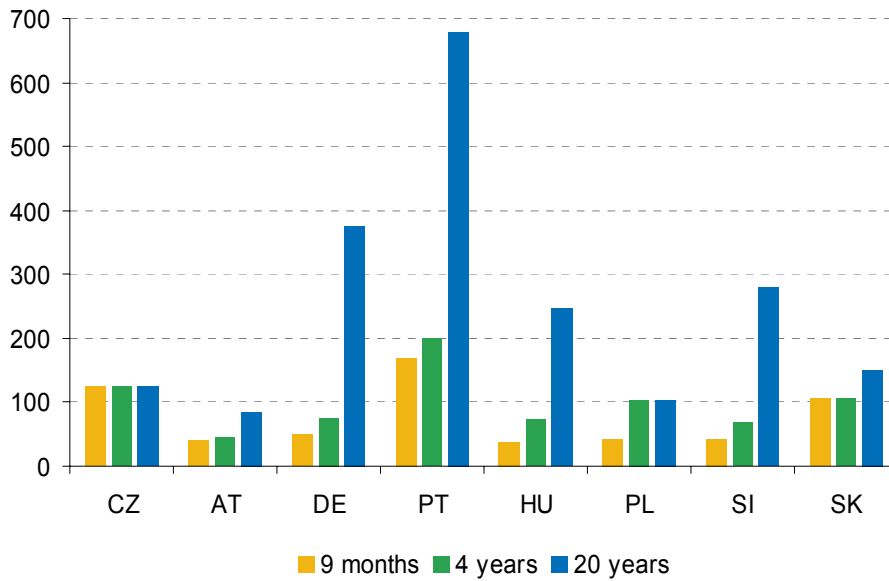
^{e)} Weighted average of indicators of permanent employment, temporary employment and collective dismissals.

Source: OECD; a description of the methodology is given in Venn (2009).

¹²⁷ Protection of permanent employment changed slightly in connection with the new Labour Code in 2007. This was reflected in a slight decline in the corresponding OECD index. See more in the text.

¹²⁸ For the Czech Republic, the costs of dismissing employees represent an equivalent of 124 days of the wage for all the three periods of employment shown in the chart. It is an average of 150 days (i.e. two months of notice and three months of the severance pay) for redundancy dismissals and 60 days of the wage for the other cases (two months of notice), to which 19 days are added, covering the necessary period for serving the notice on the employee and the start of the period of notice.

Chart 46: Costs of individual termination of an open-ended contract by employment contract duration in 2008 (number of days for which wage is paid)



Note: Sum of data for days of notice, severance pay and delay to start of notice period.

Sources: OECD, CNB calculations.

A very low index for the protection of temporary employment combined with high protection of permanent employment in the Czech Republic (see Table 50) suggests the risk of labour market duality, where temporary workers have only a small chance of gaining permanent employment. With respect to collective dismissals of employees (above the level of individual dismissals), the Czech Republic applies the lowest restrictions by comparison with the countries under review except Portugal.

In terms of the aggregate index of employment protection, which is a weighted average of the three foregoing components, the Czech Republic ranked among the countries with average labour market regulation in 2008 as compared to the sampled countries.¹²⁹ However, one should take into account that there is a disparate intensity of protection of permanent and temporary jobs behind the average figure, which may result in the above issue of labour market duality. Moreover, employment through employment agencies is relatively widely used in the Czech Republic, since employees of employment agencies are not subject to the prohibition of repetition of fixed-term contracts, which gives employers a greater degree of flexibility compared to permanent contracts.

Under the new Labour Code effective from January 2007, conditions for the dismissal of employees remained practically unchanged. The notice period for redundancy was reduced from three to two months, while severance payment was increased from two to three monthly salaries. This regulation does not even grade these conditions according to the duration of employment. The permanent employment protection index declined slightly overall, from 3.3 in 2006 to 3.1.¹³⁰ The temporary employment index and the index of conditions for collective

¹²⁹ However, European labour markets are generally rather inflexible, so the benchmark offers a rather low standard in this case.

¹³⁰ The difficulty in dismissing employees has decreased slightly since January 2007, as employers, in the case of redundancy dismissals, are no longer be required to consider the option of transferring employees to another job or retraining them.

dismissals were the same as in 2006. These figures hold for 2008 and 2009, too, since no other measures have been taken that affect the employment protection index.¹³¹ Thus, the adverse impact of permanent employment protection on job creation and long-term unemployment is still higher than in the countries under comparison except for Portugal and Slovenia.¹³²

2.3.4.4 Labour taxation

Labour taxation directly affects labour costs and job creation, in particular those for people with low skills and for specific groups, such as women, school-leavers and older people. Moreover, high labour taxation increases the proportion of entrepreneurs in the labour force and the size of the grey economy (Brandt et al., 2005). Higher taxation of labour may have more pronounced effects on unemployment growth in the case of a high minimum wage (Bassanini and Duval, 2006).¹³³ The taxation of people with high incomes is important in conditions of international competition, as people with high skills and high incomes have a greater propensity to migrate.

Overall labour taxation¹³⁴ in the Czech Republic in 2008 was higher than in Portugal, Poland and Slovakia both at the average wage level and for low-income earners (see Table 51). Labour taxation at the average wage level is rising slowly in the Czech Republic¹³⁵, while declining in the other countries except Austria and Portugal. Taxation of low-income earners is falling in the Czech Republic as in the other countries except Austria.

¹³¹ Minor revisions to the Labour Code were passed in the second half of 2007, but these do not affect the employment protection index.

¹³² The costs of terminating open-ended contracts declined in Portugal in 2009. This will result in a fall in the EPL index for permanent employment compared to the previous year, from 4.2 to 3.6.

¹³³ Higher taxation cannot be shifted onto employees in this case.

¹³⁴ Overall labour taxation (tax wedge) is defined as social security contributions paid by employees and employers and income taxes relative to overall labour costs. The data on labour taxation (see Table 51) are calculated in line with the applicable tax legislation for a model household.

¹³⁵ Labour taxation at the average wage level has slightly increased due to the “cold progression”, where the tax burden increases due to growing nominal income. The taxation rate at the average wage level would be slightly lower in 2008 than in 2007 if the calculation assumed the same average wage in both years. Data shown in Table 51 are calculated for individuals without children. The lower tax burden in 2008 compared to a year earlier increased the net income of those households which can apply tax discounts for a non-working wife or for children (see section 2.3.4.5).

Table 51: Overall labour taxation

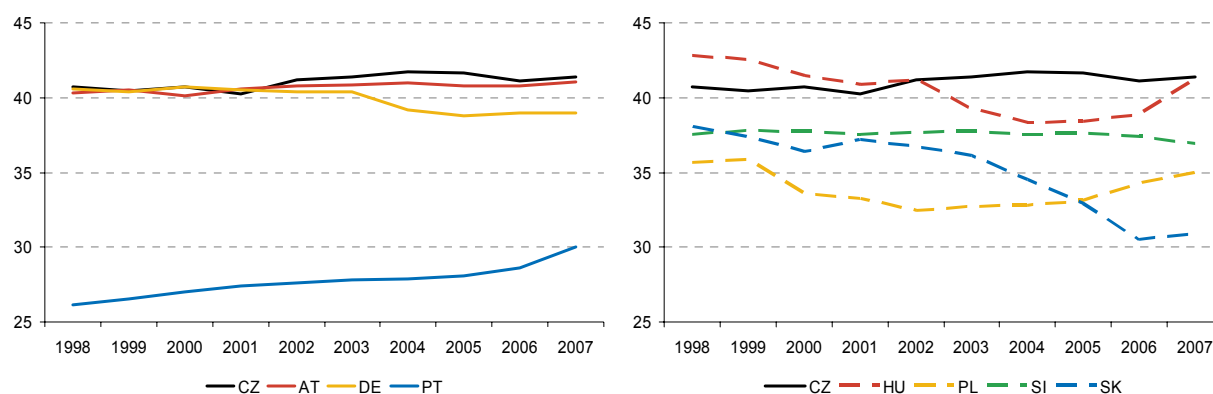
	100% of average wage				67% of average wage			
	2000	2007	2008	Change ^{a)}	2000	2007	2008	Change ^{a)}
CZ	42.7	42.9	43.4	0.7	41.4	40.6	40.0	-1.4
AT	47.3	48.6	48.8	1.5	43.2	44.1	44.4	1.2
DE	54.0	52.6	52.0	-2.0	48.6	47.7	47.3	-1.3
PT	37.3	37.7	37.6	0.3	33.2	33.0	32.9	-0.3
HU	54.6	54.5	54.1	-0.5	51.4	46.0	46.7	-4.7
PL	43.1	42.9	39.7	-3.4	42.0	41.8	38.7	-3.3
SK	41.7	38.6	38.9	-2.8	40.5	35.6	36.1	-4.4

Notes: Income tax and social security contributions paid by employees and employers as a percentage of total labour costs. Data for employees (individuals without children) earning 100% (left-hand part of the table) and 67% (right-hand part of the table) of the average wage.

^{a)} Differences in p.p. for 2000–2008.

Sources: OECD (2009), CNB calculations.

The real tax burden in terms of aggregate tax revenues as a percentage of a potential tax base in relation to the production factor of labour is described by **implicit tax rates** (see Chart 47). In 2007, this indicator was the highest in the Czech Republic of all the selected countries. Slightly lower implicit tax rates were recorded by Hungary, Germany and Austria, while significantly lower implicit tax rates were recorded in Poland, Portugal, Slovakia and Slovenia. Between 1998 and 2007, this indicator showed a decline in Hungary, Germany, Poland, Slovakia and Slovenia, while remaining broadly flat in the Czech Republic and increasing in Austria and, in particular, Portugal. The data on the components of the implicit labour taxation rate (see Chart 48) show that in all the selected countries health and social insurance affects the implicit tax rate to a greater extent than income tax. Of all the selected countries, the highest insurance from labour income is paid in the Czech Republic.¹³⁶

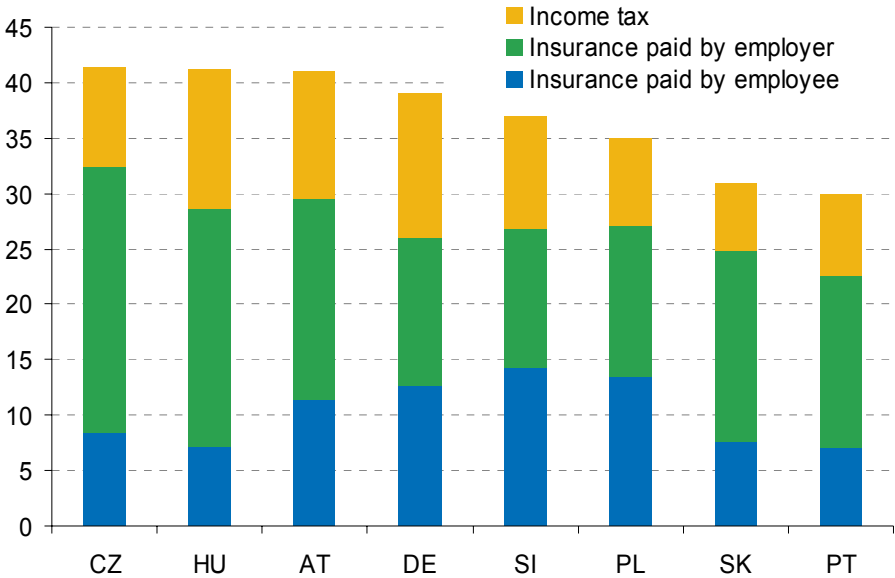
Chart 47: The implicit labour taxation rate (%)

Note: The implicit taxation rate expresses aggregate tax revenues as a percentage of the potential tax base.

Source: Eurostat (2009).

¹³⁶ A single 15% personal income tax rate (calculated in the case of employees from the so-called “super-gross wage” containing social and health insurance contributions paid by employers) and maximum assessment bases for social and health insurance premium payments were introduced in 2008. Insurance paid by employees and employers was reduced from 12.5% to 11% and from 35% to 34% respectively in January 2009.

Chart 48: Components of the implicit labour taxation rate in 2007 (%)



Note: The countries are listed in diminishing order of total insurance.
 Source: Eurostat (2009).

Given the above data, it can be assumed that the impact of labour taxation on job creation and long-term unemployment is broadly the same as in Austria, Germany and Hungary, but higher than in Portugal, Poland, Slovenia and Slovakia. Labour taxation in the Czech Republic at the average wage level increased slightly in 2000–2008, while declining for low-income groups. Of the countries under comparison, the Czech Republic has the highest insurance from labour income.

2.3.4.5 Work-incentive indicators

Net replacement rates measure the extent to which the combination of taxes and benefits affects the financial gain from work and thereby the motivation of unemployed or inactive persons to enter employment. The indicator is defined as the ratio of net household income when the person under consideration is jobless to that when the same person has a job. Table 52 compares the **net replacement rates** for short-term and long-term unemployment and for two types of households.

Table 52: Net replacement rates^{a)}

	Initial stages of unemployment ^{b)}						Long-term unemployment ^{c)}					
	Individuals without children			Family (2 children) ^{d)}			Individuals without children			Family (2 children) ^{d)}		
	2001	2006	2007	2001	2006	2007	2001	2006	2007	2001	2006	2007
CZ	59	55	67	65	64	72	53	42	51	92	76	80
AT	55	55	55	73	71	71	55	51	51	88	79	80
DE	60	61	59	81	79	78	57	48	47	81	84	82
PT	78	78	78	76	84	76	24	24	24	72	72	70
HU	58	71	73	61	78	80	28	30	31	54	75	71
PL	74	74	69	69	69	65	46	41	37	64	61	59
SK	67	61	61	76	56	57	75	28	28	122	53	53

Notes: ^{a)} The ratio of the net household income when the breadwinner is unemployed and employed (data in %). Income from employment of the breadwinner at 67% of the average wage.

^{b)} Unemployed persons entitled to unemployment benefits, excluding social assistance benefits.

^{c)} Unemployed persons after five years.

^{d)} The other adult is economically inactive, children of 4 and 6 years of age.

Source: OECD tax benefit models.

Data on short-term unemployment show that the incentive to accept employment in the Czech Republic is higher than in Portugal, Hungary and, in the case of families with children, in Germany. By contrast, the incentive to accept employment is lower in the Czech Republic than in Slovakia, Austria, Germany (individuals without children) and Poland (families with children). Among the long-term unemployed, the financial reasons for seeking a job are less strong in the Czech Republic than in Portugal, Hungary, Poland, Slovakia and Germany (individuals without children). In the Czech Republic in 2007, the incentive for the long-term unemployed was lowest for households with children, where it was at the same or a similar level as in Austria and Germany. The net replacement rates for the short-term and long-term unemployed in all types of households, shown in Table 52, increased in 2007 compared to 2006.¹³⁷ This confirms the assessment in last year's document that the reform of taxes and benefits introduced in 2007 deepened the structural problems on the labour market.^{138, 139}

Although the reform of taxes and benefits introduced in January 2008 halted the adverse trends in incentives to seek a job, it did not generate any significant reduction of the structural

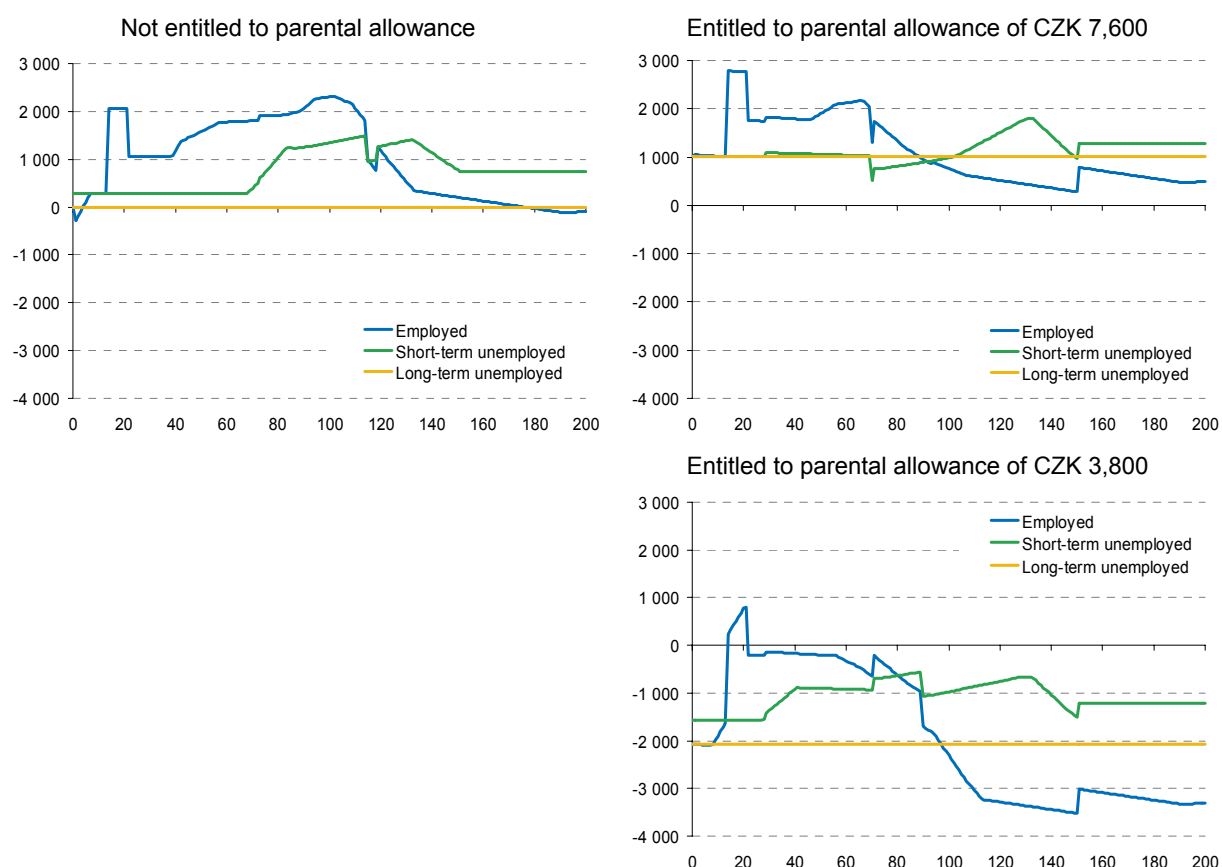
¹³⁷ The data in Table 52 do not fully capture the potential partial improvement in the incentive to seek employment connected with the coming into force of the Employment Act in October 2004 and other follow-up measures, which lay down stricter eligibility conditions for unemployment benefit and registering with labour offices.

¹³⁸ Although the new social benefit structure introduced in January 2007 financially disadvantages households with no employment income, the newly defined housing benefit causes distortions (Galuščák and Pavel, 2007; OECD, 2008). The simulation in Galuščák and Pavel (2007) shows that, compared to 2006, the financial incentive to seek a job has declined in households with children compared to 2006, but has changed less significantly for other types of households. The sharp rise in parental allowance may have weakened the incentive of non-working parents to seek work, thereby further exacerbating the loss of their job skills. Independently conducted simulations in IMF (2008) show that marginal effective tax rates increased for low-income households in 2007.

¹³⁹ Bičáková et al. (2008) estimate the response of the labour supply to a change in income using individual data from Mikrocensus 2002. The wage elasticity of the labour supply is low by international comparison, and is even lower if the changes in income are adjusted for taxes and include social benefits. According to the authors, this indicates work disincentives in the welfare system. The sensitivity of the labour supply is higher for women and those with lower incomes.

problems on the labour market (see Chart 49).¹⁴⁰ The removal of the link between the level of some benefits and the subsistence level and the removal of automatic indexation of the subsistence level reduced the risk of increasing mandatory state budget expenditures. On the other hand, it is clear that the minor changes to the parameters of some benefits did not remove the distortions in the incentives to seek a job. Housing benefit was particularly problematic in 2008. It rose compared to 2007 owing to an increase in normative housing expenses. Net income of households drawing the parental allowance of CZK 3,800 was lower than in the previous year, although in 2008 this was partly made up by higher housing benefit, especially in the case of low-income households and households of the unemployed.¹⁴¹

Chart 49: Change in the net income of households with a non-working partner in 2008 compared to 2007 (CZK)



Note: Changes in the net income of households in relation to the wages of the employed or the potential wages of the unemployed (in % of the average wage, horizontal axis) between 2007 and 2008. There is no major change in 2009. Short-term unemployed entitled to unemployment benefits. Households with a non-working partner and two children aged 4 and 6 (left-hand side) and 2 and 4 (right-hand side).

Source: CNB calculations, methodology taken from Galuščák and Pavel (2007).

¹⁴⁰ Although income tax was reduced, the net replacement rates are mainly affected by insurance and social benefit entitlements (Carone and Salomäki, 2005; see also *Labour taxation*). A more pronounced increase in net income was recorded for groups of the population with significantly higher income than shown in Chart 49.

¹⁴¹ Stricter conditions for entitlement to benefits, which are attached to a lower subsistence level in the case of the long-term unemployed who show insufficient job-seeking activity, have had a positive impact on the incentive to seek a job since January 2008.

The lower tax burden in 2008 compared to a year earlier increased the net income primarily of those households able to apply tax discounts for a non-working wife or for children. The increase in net income due to lower income tax was less apparent in the case of households with children which applied joint taxation in previous years. The reform of taxes and benefits had little effect on the indicators under review and generated no major increase in the flexibility of the supply side of the labour market in 2008 (see also Pavel, 2009).

In 2009, the social and health insurance rates paid by employees and employers were reduced slightly, while unemployment benefit in the first two months of job seeking was increased and normative housing expenses, which enter the calculation of housing benefit, were also revised. These partial changes have no significant impact on the levels of the indicators under review and thus imply no major shift compared to the situation shown in Chart 49.

2.4 Product market flexibility

2.4.1 Administrative barriers to entrepreneurship

High costs and barriers as regards business start-ups and complicated administrative regulations governing entrepreneurship reduce competitive pressures, productivity and thus flexibility on product markets. In the long run, this also has a negative impact on job creation and employment (Nicoletti and Scarpetta, 2004). According to Bassanini and Duval (2006), regulation on product markets increases overall unemployment.

An OECD index is used for international comparison of the above-mentioned administrative barriers to entrepreneurship (Conway et al., 2005; Wölfl et al., 2009). In 2008, the administrative barriers to entrepreneurship were higher in the Czech Republic than in the countries under comparison except Poland and Hungary (see Table 53, last column). As in the other countries, the overall index decreased for the Czech Republic compared to 2003.¹⁴² By international comparison, the regulatory and administrative opacity in the Czech Republic was still relatively high in 2008, being higher only in Germany and Poland. By contrast, the Czech Republic recorded the lowest barriers to competition of all the countries.

¹⁴² Data for Slovakia are only available for 2003.

Table 53: Index of administrative barriers to entrepreneurship^{a)}

	Administrative burdens on startups ^{b)}			Regulatory and administrative opacity ^{c)}			Barriers to competition ^{d)}			Barriers to entrepreneurship, total		
	1998	2003	2008	1998	2003	2008	1998	2003	2008	1998	2003	2008
CZ	2.3	2.5	2.1	2.6	2.2	1.3	1.8	1.5	1.3	2.3	2.1	1.6
AT	2.7	3.0	2.1	0.7	0.4	0.0	3.2	1.8	1.4	2.2	1.7	1.2
DE	2.5	1.6	0.5	2.5	2.2	2.0	1.9	1.8	1.4	2.3	1.8	1.3
PT	2.4	1.7	1.7	1.8	1.3	0.0	2.4	1.7	1.8	2.2	1.6	1.2
HU	3.1	2.7	2.9	0.3	0.3	0.6	2.2	2.4	1.8	1.9	1.8	1.7
PL	3.9	3.9	3.2	3.9	3.4	2.0	3.3	2.2	1.7	3.7	3.2	2.3
SK	-	2.1	-	-	0.7	-	-	1.7	-	-	1.5	-

Notes: 2008 data relate to the beginning of 2008.

^{a)} Indices ranging between 1 and 6, a higher value indicating higher barriers. The aggregate index is a weighted sum of indicators in seven basic areas, which are grouped into the three areas shown in the table.

^{b)} Administrative burdens for corporations, administrative burdens for sole proprietors (natural persons), sector specific administrative burdens.

^{c)} Licences and permits system, government communication strategy and simplification of rules and procedures.

^{d)} Legal barriers to entry into the industry, antitrust exemptions for public enterprises.

Source: OECD Product Market Regulation Database.

An amended Trades Licensing Act took effect in the Czech Republic in July 2008, reducing the costs of starting up and carrying on trades. Trade certificates and licences have been replaced by an extract from the Register of Trades and the extract issuance period has been shortened. In addition, the charges for issuing certificates have been reduced and the local competence of trade licensing offices has been cancelled. The system of trades has been made more transparent and simplified. The administrative environment in the Czech Republic has thus partially improved, and this, in turn, has reduced its potential adverse impact on labour market flexibility in the job creation area. This is reflected in a decline in the index of administrative barriers to entrepreneurship for the Czech Republic (see Table 53).

World Bank data on business conditions confirm that Czech Republic's world ranking as regards the conditions for starting a business improved in 2008 (see Table 54). Relative to the other countries included in the Doing Business database, the Czech Republic is in 86th place in 2008. Of the countries under review, Hungary, Portugal, Slovakia and Slovenia have better conditions for starting a business than the Czech Republic, while Germany, Poland and Austria have worse conditions. As regards closing a business, the Czech Republic has the worst ranking among the countries under comparison, down by two places from 2007.¹⁴³

¹⁴³ The data on the country rankings in 2007 were recalculated owing to changes in methodology and the selection of countries. Rankings for previous years are not available. Only partial data from which the country rankings were derived are published.

Table 54: Conditions for starting and closing a business

	Starting a business		Closing a business	
	2007	2008	2007	2008
CZ	93	86	111	113
AT	83	104	21	20
DE	75	102	31	33
PT	40	34	20	21
HU	72	27	56	55
PL	134	145	91	82
SI	124	41	37	38
SK	76	48	39	37

Note: Country rankings as the conditions for starting and closing a business. Starting a business: number of procedures, time (days), cost and minimum capital requirements in % of income per capita. Closing a business: time (years), cost in % of total assets and recovery rate in cents on the dollar.

Source: World Bank (2008).

2.4.2 Tax burden on businesses

The tax burden on businesses significantly affects product market flexibility. Given the high international mobility of capital, the taxation rate can be one of the deciding factors for investment allocation. The corporate tax rate is assessed by means of the statutory corporate income tax rate and the implicit tax rate.

The Czech Republic applies a **corporate income tax rate** of 20% in 2009 (see Table 55). Higher tax rates are recorded in Austria, Germany, Portugal, Hungary and Slovenia. Businesses in Poland and Slovakia are exposed to lower tax burdens in terms of statutory tax rates. Corporate income tax rates are declining sharply in the countries under comparison, except for Hungary and Slovenia, which had the lowest tax burdens on average throughout the period under review.

Table 55: Highest statutory corporate income tax rates (%)

	1998	2002	2003	2004	2005	2006	2007	2008	2009	Change (p.p.)
CZ	35.0	31.0	31.0	28.0	26.0	24.0	24.0	21.0	20.0	-15.0
AT	34.0	34.0	34.0	34.0	25.0	25.0	25.0	25.0	25.0	-9.0
DE	56.0	38.3	39.6	38.3	38.7	38.7	38.7	29.8	29.8	-26.2
PT	37.4	33.0	33.0	27.5	27.5	27.5	26.5	26.5	26.5	-10.9
HU	19.6	19.6	19.6	17.6	17.5	17.5	21.3	21.3	21.3	1.7
PL	36.0	28.0	27.0	19.0	19.0	19.0	19.0	19.0	19.0	-17.0
SI	25.0	25.0	25.0	25.0	25.0	25.0	23.0	22.0	21.0	-4.0
SK	40.0	25.0	25.0	19.0	19.0	19.0	19.0	19.0	19.0	-21.0

Note: Changes in p.p. for 1998–2009.

Source: Eurostat.

The tax rates are simple indicators of the taxation rate. However, the tax burden is also determined by the tax base, which is affected by depreciation, amortisation and tax exemptions. The **implicit tax rates**, defined as aggregate corporate income tax revenues as percentage of the potential tax base, are thus a complementary indicator of the tax rate (see Table 56). The implicit tax rate in the Czech Republic declined between 2004 and 2007 in line

with the statutory rate. In 2007 and 2006, the implicit taxation rate was higher in the Czech Republic than in Portugal, Hungary, Poland and Slovakia.¹⁴⁴

Table 56: Implicit corporate income taxation rate (%)

	1998	2002	2003	2004	2005	2006	2007	Change (p.p.)
CZ	27.8	30.3	32.0	29.8	25.4	25.6	24.1	-3.8
AT	28.6	28.3	26.8	26.0	22.9	23.0	24.8	-3.8
PT	20.0	22.4	19.0	18.8	19.4	22.6	-	2.6
HU	-	19.8	17.5	17.1	17.0	14.7	-	-9.2
PL	42.7	37.0	21.9	18.7	20.8	19.5	-	-23.2
SI	-	24.6	21.0	23.0	33.6	30.4	32.9	13.3
SK	52.4	34.7	35.3	22.6	23.5	20.3	19.5	-32.9

Note: The implicit taxation rate expresses aggregate tax revenues as a percentage of the potential tax base. Changes in p.p. for 1998–2007.

Source: Eurostat.

2.4.3 Costs associated with exit from the sector

The conditions for closing loss-making entrepreneurial projects significantly affect the existence of competition and the effective allocation of economic resources and thus have an important impact on product market flexibility. Insolvency law is a standard part of legal systems. The Czech Republic passed Act No. 328/1991 Coll., on Bankruptcy and Composition, in 1991. This Act was subsequently frequently amended and on 1 January 2008 was replaced by Act No. 182/2006 Coll., on Insolvency and the Methods of its Resolution (Insolvency Act). The new Act should foster faster, more transparent, more effective and more legally certain relationships between debtors and creditors. Moreover, it introduced the possibility of personal bankruptcy for private individuals.

The **number of insolvency petitions**¹⁴⁵ in the Czech Republic is low by international comparison. In 2008, there were 50 insolvencies per 10,000 corporations in the Czech Republic, while the European average is around 83 insolvencies per 10,000 corporations (see Table 57).¹⁴⁶ Substantial differences exist across sectors. In 2008, the highest insolvency rates in the Czech Republic were recorded in the paper industry and the textile and leather industry (233 and 220 insolvencies per 10,000 corporations respectively).¹⁴⁷ The increased risk of default linked with the incipient economic recession was reflected in a rise in the number of insolvencies of 6% in 2008 (see Chart 50).

¹⁴⁴ Data on the implicit taxation of corporate income are not available for Germany.

¹⁴⁵ For “insolvency petition” the shortened term “insolvency” is used in the text.

¹⁴⁶ This international comparison was performed differently from those in the other parts of the document owing to a lack of data.

¹⁴⁷ Travel agencies, manufacture of glass, ceramics and construction materials, the food industry, manufacture of chemicals and plastics and mining and quarrying also recorded above-average insolvency rates in 2008.

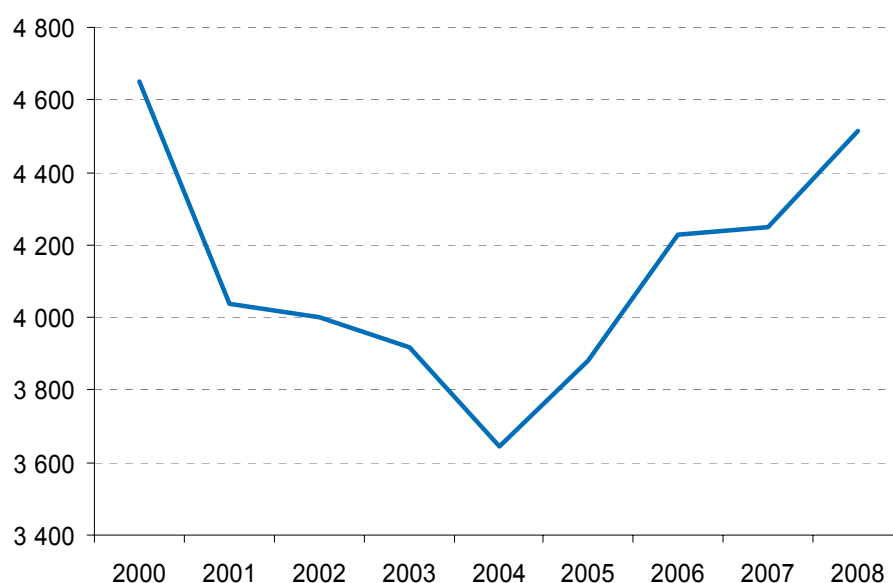
Table 57: Number of corporate and personal insolvencies in 2008

	Insolvencies	
	Corporate (per 10,000 corporations)	Personal (per 10,000 individuals)
CZ	50	2
AT	224	11
DE	96	15
PT	40	-
Average	83 ^{a)}	15 ^{b)}

Notes: ^{a)} Average for 17 Western European countries.

^{b)} Average for 7 Western European countries.

Source: Creditreform.

Chart 50: Number of bankruptcy petitions

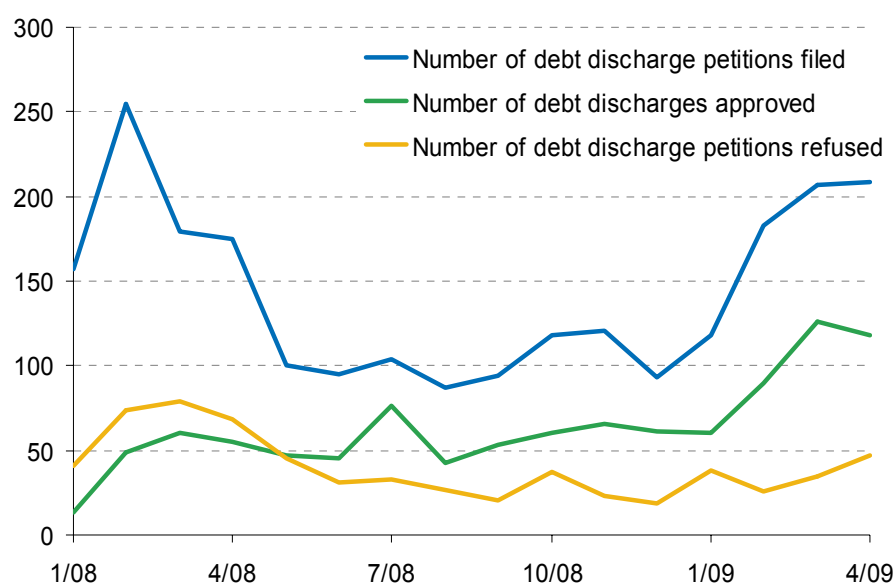
Source: Ministry of Justice of the Czech Republic.

A new Insolvency Act, introducing the option of debt discharge for private individuals (personal bankruptcy), took effect in the Czech Republic on 1 January 2008. Overleveraged households gradually started to make use of this option during 2008. The evolution of the number of **discharge petitions**¹⁴⁸ (see Chart 51) reflects increased interest in the first few months after the Act took effect and a renewed gradual increase at the start of 2009. The number of such cases can be expected to increase as this instrument becomes increasingly used by overleveraged households during the economic recession, which will have a negative effect on disposable income. In Western European countries, there are roughly 15 personal insolvencies per 10,000 people a year on average. This suggests that the number of personal insolvencies could run to 8,000–9,000 a year in the Czech economy.¹⁴⁹

¹⁴⁸ The petitions are assessed by the courts, which then rule on whether to allow discharge.

¹⁴⁹ However, the situation is very mixed across individual countries, depending on legislation and traditions. A high number of personal insolvencies is especially typical of the UK and Germany, while the advanced Nordic countries of Europe have a very low number.

Chart 51: Discharge of debts of private individuals



Note: Monthly flows.

Sources: Creditreform, CNB calculations.

2.5 Flexibility and shock-absorbing capacity of the banking sector

The capacity of the financial system to absorb shocks depends, among other things, on its performance and stability. While a profitable and sound financial sector may be effective in helping to eliminate the impact of economic shocks, inefficient and unsound financial institutions may increase the unfavourable effects of negative shocks. A vulnerable financial system may also itself be a source of asymmetric shocks. The following analyses will concentrate on the banking sector, which has the greatest weight in the financial system in the countries under comparison. The situation in the insurance and fund sectors is outlined briefly.

Recent years have seen a decrease in the ratio of non-performing bank loans in the Czech Republic. In addition to better loan repayment, however, the dilution of bad loans by strong new lending may have been a hidden contributor to the improvement in portfolio quality. However, this trend has been turning since the end of 2008. In 2008, the Czech banking sector recorded a deterioration in **loan portfolio quality** compared to the previous year and had the third-highest ratio of non-performing loans among the countries analysed, behind Poland and Slovenia (see Table 58). The lower client creditworthiness and slower new lending were reflected in a higher ratio of non-performing loans to total loans, which stood at 4.7% at the end of June 2009.¹⁵⁰

¹⁵⁰ A deterioration was visible both for non-financial corporations (6.2% of loans non-performing) and for households (3.3%), especially in the consumer credit segment (7.5%).

Table 58: Non-performing loans / total loans in the banking sector (%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008 ^{a)}
CZ^{d)}	19.9	13.7	8.9	4.8	4.0	3.9	3.7	2.8	3.3
AT	2.9	3.1	3.9	3.7	3.3	2.6	2.1	2.4	2.0
DE	4.7	4.6	5.0	5.3	4.9	4.0	3.4	2.7	2.3
PT	2.2	2.1	2.3	2.4	2.0	1.6	1.2	1.3	1.7
HU	2.5	2.7	3.1	2.7	2.7	2.5	2.5	2.4	3.0
PL	14.9	17.8	21.1	21.2	14.9	11.0	7.2	5.2	4.4
SI	5.2	7.0	7.0	6.5	5.5	4.8	4.1	1.8	3.9
SK	21.7	22.0	11.2	9.2	7.2	5.6	3.3	2.8	1.7
EA^{c)}	3.3	4.1	3.3	3.4	3.1	3.0	2.1	1.8	2.4

Notes: ^{a)} Preliminary data.

^{b)} Data for the Czech Republic exclude Konsolidační banka and banks under conservatorship.

^{c)} Simple average. Weighted average up to 2005. The structure of the euro area total varies according to the number of euro area member countries in each year.

Sources: CNB, national central banks. Unconsolidated data.

The **capital adequacy ratio** of the Czech banking sector was 12.3% at the end of 2008, comparable to the euro area average (see Table 59). In 2009 H1 the capital adequacy ratio rose to 13.7% thanks to the inclusion of retained earnings from 2008 and an increase in the capital buffer linked with the slowdown in loan growth. The capital position of the domestic sector can be regarded as good and sufficient to cover the potential risks even at a time of deteriorating loan portfolios.

Table 59: Capital adequacy of the banking sector (%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008 ^{a)}
CZ^{d)}	14.9	15.4	14.2	14.5	12.6	11.9	11.5	11.6	12.3
AT^{c)}	10.6	11.5	11.3	12.1	11.9	11.5	11.6	12.1	11.0
DE^{c)}	11.7	12.0	12.7	13.4	13.2	12.2	11.9	11.7	13.0
PT^{c)}	9.2	9.5	9.8	10.0	10.4	11.3	11.8	11.0	10.3
HU^{d)}	13.7	13.9	13.0	11.8	12.4	11.6	11.0	11.3	11.1
PL^{d)}	12.9	15.0	14.2	13.8	15.5	14.5	13.1	12.0	11.1
SI^{d)}	13.5	11.9	11.9	11.5	11.8	10.5	10.8	10.6	11.7
SK^{d)}	2.4	13.4	21.3	21.6	18.7	14.8	13.0	12.8	11.3
EA^{c), d)}	11.6	12.1	11.9	11.9	11.8	11.8	12.1	11.6	12.4

Notes: ^{a)} Preliminary data.

^{b)} Unconsolidated data.

^{c)} Consolidated data.

^{d)} Simple average. Weighted average up to 2005. The structure of the euro area total varies according to the number of euro area member countries in each year.

Sources: CNB, national central banks.

The stability of the banking sector stems from the **profitability of the banking business**. Despite the adverse economic situation, net interest margins in the countries under comparison remained broadly stable in 2008. In the Czech banking sector, the net interest margin kept following the moderate upward trend visible since 2003, reaching 2.8% in 2008 (see Table 60).

Table 60: Net interest margin (NIM, %)

	2000	2001	2002	2003	2004	2005	2006	2007	2008 ^{a)}
CZ^{d)}	2.53	2.47	2.35	2.26	2.36	2.37	2.51	2.61	2.83
AT^{c), d)}	1.20	1.21	1.23	1.17	1.09	1.55	1.60	1.67	1.64
DE^{c), d)}	1.14	1.12	1.20	1.16	1.18	0.88	0.84	0.80	0.85
PT^{c), d)}	2.25	2.31	2.21	2.04	2.00	1.86	1.89	1.85	1.88
HU^{d)}	4.00	4.05	4.19	3.96	4.00	3.92	3.60	3.27	2.69
PL^{d)}	4.26	3.38	3.39	3.13	3.24	3.30	3.26	3.10	3.34
SI^{d)}	4.41	3.37	3.41	3.05	2.70	2.42	2.19	2.30	2.19
SK^{d)}	1.85	2.28	2.69	2.91	2.85	2.15	2.42	2.34	2.46
EA^{c), d), e)}	-	-	-	-	-	1.35	1.37	1.35	1.41

Notes: ^{a)} Preliminary data.

^{b)} Unconsolidated data.

^{c)} The share of net interest income in average total balance-sheet assets.

^{d)} Consolidated data from 2005 onwards.

^{e)} Simple average. The structure of the euro area total varies according to the number of euro area member countries in each year.

Sources: CNB, national central banks.

A comparison of net non-interest income per unit of assets is shown in Table 61. This indicator shows lower values for the Czech banking sector in 2008 than in the past, owing to write-offs of some risky assets in some banks. The banking sectors of the euro area countries under comparison recorded even larger decreases in this indicator as a result of losses from asset revaluation stemming from price declines on financial markets (e.g. Germany) and from losses suffered by bank groups in some Eastern European countries (e.g. Austria).

Table 61: Net non-interest income / average assets (%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008 ^{a)}
CZ^{d)}	1.22	1.37	1.46	1.43	1.69	1.61	1.48	1.44	1.03
AT^{c)}	1.59	0.89	0.75	0.83	0.84	0.94	0.98	0.94	0.16
DE^{b)}	0.42	0.36	0.34	0.35	0.35	0.37	0.39	0.39	-0.25
PT^{c)}	1.07	0.88	0.88	1.02	1.06	1.39	1.47	1.27	0.87
HU^{b)}	1.06	1.34	1.50	1.70	1.67	1.66	1.77	1.61	1.31
PL^{d)}	2.73	3.05	2.73	2.52	2.37	2.32	2.10	2.10	2.06
SI^{b)}	1.41	1.47	1.84	1.63	1.72	1.60	1.67	1.60	0.58
SK^{d)}	1.14	1.09	1.25	0.95	1.44	1.48	1.36	1.19	1.22
EA^{c), d)}	1.07	0.84	0.90	1.11	0.82	0.96	1.10	1.06	0.31

Notes: ^{a)} Preliminary data.

^{b)} Unconsolidated data.

^{c)} Consolidated data. Net non-interest income/assets as at year-end.

^{d)} Simple average. Weighted average up to 2005. The structure of the euro area total varies according to the number of euro area member countries in each year.

Sources: CNB, national central banks.

In recent years, the Czech banking sector has shown a high after-tax **return on assets (RoA)**, see Table 62). The higher RoA compared to the selected countries in 2008 was due mainly to income on interest and fees, lower other operating expenses and smaller write-downs due to asset revaluation. The figures for all countries and the euro area average reflected problems linked with the global financial crisis and recession. The low solvency of foreign banking sectors reflects the consequences of investment in toxic and other risky assets. The Austrian and German banking sectors recorded RoAs close to and below zero respectively.

Table 62: After-tax profit / bank assets (RoA, %)

	2000	2001	2002	2003	2004	2005	2006	2007	2008 ^{a)}
CZ ^{d)}	0,56	0,93	1,59	1,64	1,76	1,76	1,24	1,36	1,17
AT ^{c)}	1,39	1,25	0,53	0,60	0,96	0,65	0,94	0,75	0,04
DE ^{d)}	0,29	0,20	0,15	0,03	0,14	0,44	0,29	0,18	-0,28
PT ^{c)}	1,05	0,96	0,78	0,89	0,84	1,03	1,01	0,89	0,49
HU ^{d)}	1,31	1,58	1,68	1,86	2,34	2,40	1,43	1,20	1,06
PL ^{d)}	1,51	1,36	0,82	0,95	1,57	1,96	1,56	1,72	1,49
SI ^{d)}	1,14	0,45	1,11	1,00	1,06	1,00	0,89	0,91	0,41
SK ^{d)}	0,54	1,02	1,16	1,17	1,15	1,05	1,27	1,04	0,84
EA ^{c), d)}	0,83	0,47	0,40	0,47	0,58	0,61	0,75	0,77	0,13

Notes: ^{a)} Preliminary data. From 2006 onwards, the RoA data for all countries are consolidated.

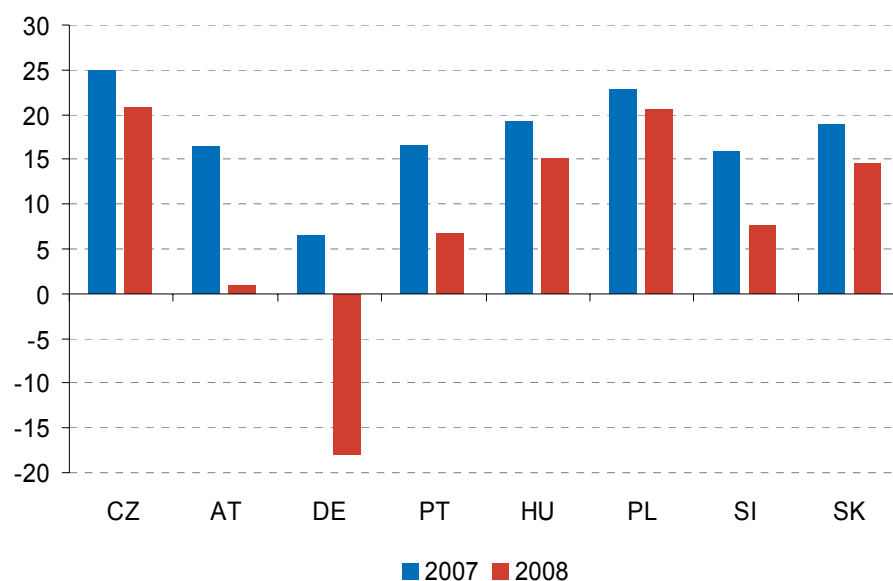
^{b)} Unconsolidated data. Pre-tax profit/average bank assets up to the end of 2005.

^{c)} Consolidated data. Pre-tax profit/assets as at year-end up to the end of 2005.

^{d)} Simple average. Weighted average up to 2005. The structure of the euro area total varies according to the number of euro area member countries in each year.

Sources: CNB, national central banks.

In 2008, **return on equity (RoE)** was highest in the Czech and Polish banking sectors. Similarly to RoA, values close to and below zero were recorded in Austria and Germany (see Chart 52). RoE has reached almost 21% in the Czech Republic because in recent years banks have cut their operating expenses relative to net income on banking activities and streamlined their operations overall. At the end of 2008, banks in the Czech Republic had a lower ratio of operating expenses to net income than the euro area average.

Chart 52: Return on equity, RoE (%)

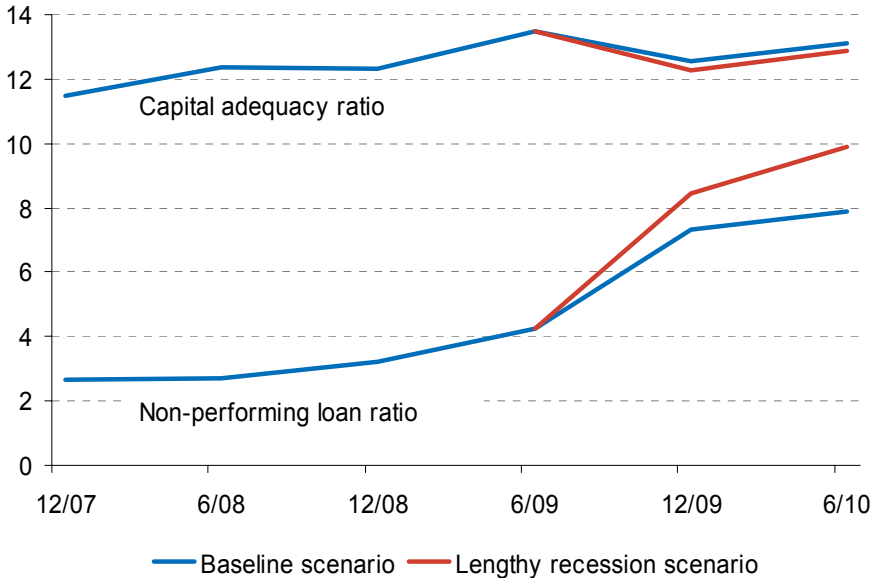
Notes: RoE values represent return on Tier I capital based on profit after tax. Data for 2007–2008.

Sources: CNB, national central banks, ECB.

The results of macroeconomic stress tests of the banking sector performed on portfolios as of the end of 2009 H1 (see Chart 53) indicate that the banking sector as a whole would be able to withstand shocks with a capital adequacy ratio well exceeding the regulatory minimum of

8% at the one-year horizon, i.e. as of 30 June 2010.¹⁵¹ The result would be favourable both for the baseline scenario and for the alternative scenario of a deeper and longer than expected economic recession (the “lengthy recession” scenario).¹⁵² In both scenarios the largest shock would stem from credit risk, as evidenced by a relatively high predicted increase in non-performing loans in both scenarios. Capital adequacy remains relatively high even in the adverse scenario, partly due to the effect of a decline in lending. According to the tests, and also by international standards, the Czech banking sector seems to be resilient to risks and does not require any capital injections implying fiscal costs. According to the credit risk model, however, the recession in the euro area and the ensuing contraction of the domestic economy increase the loan default rate not only in 2010, but also in 2011.

Chart 53: Stress test results for the Czech banking sector (%)



Source: CNB calculations.

Other entities in the Czech financial system, especially insurance companies, pension funds and open-end mutual funds, faced asset price declines in 2008 as a result of the financial market turbulence. Domestic insurance companies and pension funds were able to cover their asset revaluation losses with provisions and capital. Pension fund owners increased their funds’ capital. This created a larger buffer for covering potential asset revaluation losses depending on market developments, although funds hold the majority of their investments in debt instruments to maturity. Insurance company stability was fostered by very good solvency and also by a high ROE of 14%.

Thanks to its high profitability in recent years, the financial sector – and especially the banking sector – has created sufficient capital to absorb potential external shocks and can be regarded as relatively resilient to adverse macroeconomic factors.

¹⁵¹ Summaries of stress test results are included in the Financial Stability Reports published by the Czech National Bank. The methodology and results of the stress tests of banks, insurance companies and pension funds performed on portfolios as of the end of 2008 are discussed in more detail in the 2008/2009 Financial Stability Report (CNB, 2009).

¹⁵² The baseline scenario assumes a decline in real GDP of 3.8% year on year, while the alternative scenario assumes that GDP will drop more markedly, by 5.8%.

3 SUMMARY OF RESULTS OF ANALYSES

Analysis	Method / Category	Section	Value 2006 ^{o)}	Value 2007 ^{a)}	Value 2008 ^{b)}	Value 2009 ^{c)}	Commentary	
CYCLICAL AND STRUCTURAL ALIGNMENT								
Direct alignment indicators								
Real economic convergence	GDP per capita, PPP, EA-13=100 (2006–2008 values: EA-13=100)	1.1.1	68.5	72.1	74.1	74.1 ^{d)}	Czech Republic continues to converge. Figure for 2007 revised downwards. Indicator above levels of PT, HU, SK and PL, lower than SI.	
	Price level of GDP, EA-13=100 (2006–2008 values: EA-13=100)	1.1.1	55.0	57.8	59.8	67.9 ^{d)}	Further convergence in 2008, but still lagging well behind AT, DE, PT and SI. Temporary halt in convergence expected in 2009 owing to nominal exchange rate depreciation.	
	Real exchange rate against euro, 1998=100	1.1.1	123	129	133	151	Real appreciation present (higher on average since 1998 than in all countries compared except SK).	
	3M real interest rates	1.1.1	0.4	0.2	0.1	-2.1	Very low level since 2004. Affected in 2008 by temporary rise in inflation. Low level of real rates in past 5 years means smaller adjustment need in future.	
	3M real interest rate outlook for following 5 years given no change in exchange rate	1.1.1	-	-	(-0.6;0.5)	(-1.7;0.5)	Czech Republic would face very low or negative real interest rates, which could mean a risk of economic disequilibrium.	
Correlation coefficients of real economic activity (CZ and EA-13). 2006 value: 2001 Q1–2006 Q1 2007 value: 2002 Q1–2007 Q1 2008 value: 2002 Q1–2008 Q1 2009 value: 2002 Q1–2009 Q1	GDP (Method 1)	1.1.2	0.29	0.62	0.73	0.88	Higher values than for SK, HU and PL. High correlation is visible for all countries compared and is affected by financial and economic crisis.	
	GDP (Method 2)	1.1.2	0.26	0.33	0.34	0.84		
	GDP (Method 1, dynamic correlation, average for cycle lengths considered)	1.1.2	0.33	0.7	0.8	0.89		
	IPI (Method 1)	1.1.2	0.77	0.77	0.74	0.9	Statistically significant correlation; value comparable with or higher than in most countries compared except DE. Indicator describes only part of economy.	
	IPI (Method 2)	1.1.2	0.41	0.25	0.31	0.35		
	Method 1: year-on-year difference Method 2: quarter-on-quarter (or month-on-month) difference	Total exports (Method 1)	1.1.2	0.64	0.63	0.63	0.76	Statistically significant correlation according to both methods.
		Total exports (Method 2)	1.1.2	0	-0.04	0.36	0.47	
Czech exports to EA vs. EA GDP (Method 1)		1.1.2	0.42	0.38	0.38	0.56 ^{d)}	Statistically significant correlation according to both methods.	
Czech exports to EA vs. EA GDP (Method 2)		1.1.2	0.24	0.30	0.27	0.49 ^{d)}		

Analysis	Method / Category	Section	Value 2006 ^{o)}	Value 2007 ^{a)}	Value 2008 ^{b)}	Value 2009 ^{c)}	Commentary
Synchronisation of demand shocks	Structural vector autoregression, correlation	1.1.3	asymmetry	asymmetry	asymmetry	asymmetry	Zero correlation of shocks, unchanged between periods under review. Other countries compared except DE also show no statistically significant correlation.
Synchronisation of supply shocks	Structural vector autoregression, correlation	1.1.3	asymmetry	asymmetry	asymmetry	symmetry	Positive correlation of supply-side shocks in 2005–2009; coefficient statistically significant at 10% level. Other countries except PL also show statistically significant correlations.
Impact of asymmetric shock caused by inflow of EU funds	Calculated using fiscal impulse method in CNB's QPM macroeconomic model	1.1.4.	insignificant impact	insignificant impact	insignificant impact	moderate impact	Drawing of funds from EU proceeded gradually until 2008. In 2009, however, acceleration can be expected. Nevertheless, no major pressure on monetary policy and exchange rate is expected.
Analysis of cyclical alignment using Taylor rule	Average square of deviations from implied euro area rates (2003 Q1–2008 Q1)	1.1.5	-	-	reasonable alignment	reasonable alignment	Value comparable with SK, lower than in HU, PL and SI and higher than in euro area countries. Lower values mean greater alignment.
Structural similarity of Czech economy and EU-12 economy	Landesmann index	1.1.6	0.15	0.15	0.16	0.15	Czech value historically generally lower than in other new member states, but recently rising as result of rapid domestic growth and inflation shocks. Lower values mean greater alignment.
Convergence of interest rate differential	Difference in three-month, five-year and ten-year interest rates	1.1.7	convergence	convergence	convergence	slight divergence	Interest rate differentials widened somewhat in 2009 but remain low.
Convergence of exchange rates to euro	Bivariate GARCH	1.1.8	high correlation	high correlation	high correlation	fall in correlation	High correlation seen in past years decreased sharply owing to exchange rate volatility resulting from crisis.
Exchange rate volatility (exchange rate to euro, annualised, in %)	historical (daily returns for period of six months)	1.1.9	<5 (2006)	4 (2007)	5–8 (2008)	13–16 (2009)	CZK has average to low volatility. However, growth in volatility due to uncertainty in world financial markets is gradually subsiding. Volatility still lower than PL and HU.
	implied (options)	1.1.9	<5,5 (2006)	4 (2007)	5–7 (2008)	9–19 (2009)	
	historical (quarterly returns, since 1999)	1.1.9	3.8	3.6	3.6	4.2	Variability lower than HU and PL, same as SK.
	fundamental (OCA criteria)	1.1.9	6.0	5.9	5.8	5.8	Fundamental variability similar for CZ, HU and SI, lower for SK and high for PL.
Effect of international economic relations							
Share of foreign trade with euro area in total foreign trade	Exports,%	1.2.1	59.3	58.4	57.1	68	High level of trade links. Highest on export side; among higher ones on import side. Increase compared to 2008 value reflects inclusion of SK in euro area total.
	Imports, %	1.2.1	52.9	58.4	59.1	61	
Ratio of direct investment to/from euro area to GDP	Inflow of direct investment, % (stock)	1.2.1	38 (2004)	42 (2005)	43 (2006)	48 (2007)	High level of ownership links, particularly on FDI inflow side.
	Outflow of direct investment, % (stock)	1.2.1	1 (2004)	1 (2005)	1 (2006)	2,3 (2007)	
Share of intra-industry trade	Grubel-Lloyd index	1.2.2	0,8 (2004)	0,8 (2005)	0,8 (2006)	0,4 ^{d)} (2009)	High share of intra-industry trade (only AT and DE have higher shares) remains broadly unchanged. Fall in value is due to change in method and was seen for all countries.

Analysis	Method / Category	Section	Value 2006 ^{o)}	Value 2007 ^{a)}	Value 2008 ^{b)}	Value 2009 ^{c)}	Commentary
Financial market							
Financial sector	Financial system assets, % of GDP	1.3.1	135	133	142	146 ^{d)}	
	Bank loans to non-bank clients, % of GDP	1.3.1	40.5	45.3	51.9	56.8	Ratio of financial system assets to GDP and ratio of loans to GDP are substantially lower than in AT, DE and PT, slightly lower than in SI and higher than in SK and PL. As regards structure of the Czech financial sector, similar to euro area average. Ratio of loans to households is rising dynamically.
	Banking sector assets / financial system assets, %	1.3.1	73.6	73.3	74.2	75.0	
	Bank loans to households, % of total loans	1.3.1	34.7	38.2	40.9	42.4	
Conditions for transmission of monetary policy changes to firms and households	Structure of financial assets and liabilities of corporations and households	1.3.2	-	-	differences exist	differences exist	
	Effect of monetary policy on client interest rates and loans	1.3.3	-	-	-	similarity	Effect of money and financial market rates on client rates was broadly similar in Czech Republic as in euro area. However, slightly greater rigidity of client rates is emerging in Czech Republic owing to economic crisis. As regards structure of new loans, greater weight of long fixations is apparent only for loans for house purchase in Czech Republic.
	Spontaneous euroisation	1.3.4	-	-	low	low	Use of euro by Czech corporations is consistent with openness of economy. Czech households make minimal use of euro in transactions and their debt in euro is also minimal.
Stock market integration Speed of convergence of yields with yields in euro area (beta-convergence coefficient, since 08/2007)	Money market	1.3.5	-	-0.6	-0.6	-0.4	High speed of adjustment on stock and bond markets until mid-2007 (higher than that in AT and PT). On foreign exchange market comparable to other countries under review; lower on money market. Recently, however, some decline in speed of adjustment has occurred on all markets analysed except foreign exchange market as result of financial crisis.
	Foreign exchange market	1.3.5	-	-0.9	-0.8	-0.9	
	Bond market	1.3.5	-	-0.9	-0.8	-0.7	
	Stock market	1.3.5	-0.9	-0.9	-0.9	-0.8	

Analysis	Method / Category	Section	Value 2006 ^{o)}	Value 2007 ^{a)}	Value 2008 ^{b)}	Value 2009 ^{c)}	Commentary
ADJUSTMENT MECHANISMS							
Fiscal policy							
General government deficit	CNB estimate % of GDP, ESA 95	2.1.2	-3.5 (2006)	-3.5 (2007)	-1.0 (2007) -0.8 (2008)	-2.1 (2008) -6.0 (2009)	Figures for 2008 and outlook for 2009 show impacts of recession and of predominantly revenue-side measures adopted. In 2009 deficit will significantly exceed Stability and Growth Pact reference value, and further growth is expected for 2010. Excessive Deficit Procedure will be imposed.
Public debt	CNB estimate % of GDP, ESA 95	2.1.2	30.6 (2006)	30.5 (2007)	28.9 (2007) 27.6 (2008)	30.0 (2008) 35.7 (2009)	Substantial rise in debt expected owing to recession. Public debt ratio will stay below Maastricht convergence criterion, but risk to its sustainability remains.
Wage and price flexibility							
Rate of adjustment of real wage growth to unemployment rate	Phillips curve	2.2.1	-0.008	-0.019	-0.030	-0.009 ^{d)}	Real wage flexibility low as in other countries compared. However, nominal wage developments in Czech Republic recently indicate some flexibility in this area.
	Wage curve	2.2.2	-	0.06	-	0.04	No statistically significant relationship observed between regional unemployment and regional wages in Czech Republic recently. This signals low flexibility.
Sources of nominal and real wage rigidity (2002–2006)	Wage freezing	2.2.2	-	-	0.259	0.265 ^{d)}	Czech Republic has highest occurrence of wage freezing and wage cutting and roughly average occurrence of wage indexation. Results differ slightly from last year only as result of use of weighted data (unweighted last year). Wage freezing very widespread in current crisis.
	Wage cutting	2.2.3	-	-	-	0.084	
	Wage indexation	2.2.2	-	-	0.113	0.117 ^{d)}	
Inflation persistence 1998–2006	Method 1 (non-parametric)	2.2.3	0.93	0.92	0.79 ^{c)}	0.79	According to all methods, Czech Republic ranks among countries with lower inflation persistence. Method 3, which probably best takes into account transition nature of Czech economy, assesses inflation persistence as lowest among countries compared.
	Method 2 (sum of AR coeffs, constant mean)	2.2.3	-	0.74	0.83	0.82	
	Method 3 (sum of AR coeffs, time-varying mean)	2.2.3	-	0.45	0.32	0.32	
Labour market flexibility							
Long-term unemployment	Long-term unemployment rate, %	2.3.1	4.2	3.9	2.8	2.2	Further fall in long-term unemployment rate. Upswing in long-term unemployment expected owing to recession. Share of long-term unemployed is third-highest behind SK and DE.
	Long-term unemployment as share of total unemployment, %	2.3.1	53	54	52	49	
Regional differences in unemployment	Coefficient of variation in unemployment rate (at regional level, NUTS-3)	2.3.1	44 (2004)	47 (2005)	47 (2007)	45 ^{d)} (2008)	According to new data, growth occurred in 2008, probably linked with business cycle. Regional differences in unemployment rank among highest of countries compared.

Analysis	Method / Category	Section	Value 2006 ^{o)}	Value 2007 ^{a)}	Value 2008 ^{b)}	Value 2009 ^{c)}	Commentary
Labour market flexibility (cont.)							
Population mobility	Internal migration – per 1,000 inhabitants	2.3.1	20.9	21.9	24.9	24	Internal migration probably lower than in AT and DE and higher than in PL, SI and SK.
Structural unemployment	NAIRU structural unemployment rate, %	2.3.2	-	-	-	6	Structural unemployment rate among lower ones of countries compared. AT significantly lower, however.
International migration	Immigrants – per 10,000 inhabitants	2.3.3	59	66	101	74.6	International mobility fell in 2008, probably owing to economic slowdown. Changes in immigration flows are sign of flexibility, but may be manifestation of other rigidities in Czech labour market.
Institutional environment	Trade unions and collective bargaining – coverage of employees by collective agreements (%)	2.3.3	minor impact	minor impact	51 (2006)	51 (2006)	Higher in CZ than in HU and PL and lower than in DE, AT, PT and SI. Practice of extending binding nature of higher collective agreements is not very common in Czech Republic. Wage flexibility in wage formation area is thus not constrained in business sector any more than in euro area countries.
	Minimum wage as % of average wage in industry and services	2.3.3	38.8 (2004)	39.1 (2005)	38.1	38.1 (2007)	Halt in growth and slight decline is positive development. Further decreases occurred in 2008 and 2009, as minimum wage remained same as in 2007.
	Employment protection legislation index – permanent employment (OECD)	2.3.3	3.3 (2003)	3.3 (2006)	3,2 (2007, CNB estimate)	3.1	Slight fall. Together with DE and SI lower than PT and higher level of employment protection than others.
	Employment protection legislation index – temporary employment (OECD)	2.3.3	0.5 (2003)	1.1 (2006)	1.1 (2007, CNB estimate)	0.9 ^{d)}	Behind SK lowest level among countries compared. Unchanged since 2006 (revision of OECD indicator).
	Overall labour taxation (persons on average wage, %)	2.3.3	43.8	42.6	42.9	43.4	Higher than in PT, PL and SK, but lower than in other countries compared. Rise in taxation at average wage level.
	Overall labour taxation (persons on two-thirds of average wage, %)	2.3.3	42.1	40.1	40.5	40	
	Share of net income of households without and with employment, % ^{e)}	2.3.3	81 (2004)	74 (2006)	74 (2006)	80 (2007)	Reduction in incentive to seek and accept work for all categories of households analysed compared to previous year. Together with AT and DE lowest incentive for long-term unemployed among countries compared.

Analysis	Method / Category	Section	Value 2006 ^{o)}	Value 2007 ^{a)}	Value 2008 ^{b)}	Value 2009 ^{c)}	Commentary
Product market flexibility							
Administrative barriers to entrepreneurship	Index of administrative barriers to entrepreneurship (OECD)	2.4.1	1,9 (2003)	1,9 (2003)	1.9 (2003)	1.6 ^{d)}	Partial improvement in 2005–2008. Together with HU highest behind PL.
	Conditions for starting a business (ranking, World Bank)	2.4.1.	-	-	86 (2008)	86 (2008)	Conditions for establishing business are better in PT, HU, SI and SK, but worse in AT, DE and PL.
	Conditions for closing a business (ranking, World Bank)	2.4.1.	-	-	113 (2008)	113 (2008)	Worst among countries compared.
Taxation rate	Implicit taxation rate	2.4.2	-	-	23.4 (2006)	24.1 ^{d)} (2007)	Fall in implicit taxation rate in 2007. Higher than in PT, HU, PL and SK. Statutory corporate income tax rate is one of lower ones among countries compared.
Exit from sector	Costs associated with exit from sector	2.4.3	-	-	better	no change	Rising number of bankruptcies since 2004. Big increases in 2007 and 2008.
Flexibility and shock-absorbing capacity of banking sector							
Non-performing loans	Percentage share of total loans	2.5	3.9	3.7	2.8	3.3	Increase due to recession. Highest ratio behind PL.
Net interest margin	%	2.5	2.4	2.4	2.6	2.8	Interest margin has increased modestly in recent years. Lower than in PL. Higher than in euro area countries compared.
Net non-interest income	Percentage of average assets	2.5	1.6	1.5	1.4	1.0	Decrease reflects write-downs of some risky assets in some banks. Higher percentage of net non-interest income than euro area countries compared except SK.
After-tax profit/average assets	%	2.5	1.8	1.6	1.3	1.2	Behind PL highest among countries compared.
Capital adequacy in banks	%	2.5	11.9	11.4	11.5	12.3	Growth; capital adequacy at relatively high level, slightly higher than euro area average.
Capital adequacy in banks after stress tests	%	2.5	10.2	9.9	10.8	12.0	Sufficient level.

- Notes:
- ^{o)} “Value 2006” is the most recent value of the indicator compared in the 2006 document. Unless stated otherwise, the data are for 2005.
 - ^{a)} “Value 2007” is the most recent value of the indicator compared in the 2007 document. Unless stated otherwise, the data are for 2006.
 - ^{b)} “Value 2008” is the most recent value of the indicator compared in the 2008 document. Unless stated otherwise, the data are for 2007.
 - ^{c)} “Value 2009” is the most recent value of the indicator compared in the 2009 document. Unless stated otherwise, the data are for 2008.
 - ^{d)} “Value 2009” is not fully comparable with “Value 2008”. The reasons include in particular a revision of the data on the variable observed, a change in calculation, or a different implementation (in the case of fiscal policy).
 - ^{e)} Unemployed after five years, potential income from employment at 67% of the average wage. Second person economically inactive, children 4 and 6 years old.

E METHODOLOGICAL PART

Executive Summary – Slovakia: Analysis of external trade relationships using error correction models

The effect of the expected and realised fixing of the Slovak koruna on Slovakia's exports and imports is quantified using error correction models (ECM), which model exports and imports of goods and services separately. The analysis is based on seasonally adjusted variables at constant prices and at quarterly frequency. The main data source is the NewCronos database (Eurostat). Data on the international investment position¹⁵³ were obtained from the website of the National Bank of Slovakia.

In the case of exports, a long-term cointegration relationship is first estimated in the following form:

$$EXP_t = c_0^e + c_1^e GDP_DE_t + c_2^e FDI_t + e_t^e,$$

where EXP_t are Slovak exports, GDP_DE_t is German GDP and FDI_t is the real stock of foreign direct investment in Slovakia calculated using the gross fixed capital formation deflator. According to the ADF test, these variables have the same order of integration, i.e. I(1). The ADF test of the residuals of the long-term relationship rejects the presence of a unit root, which indicates cointegration of the variables. The lagged residuals can therefore be used as the error correction term in the equation for exports, which has the following specification:

$$\Delta EXP_t = b_0^e + b_1^e \Delta GDP_DE_t + b_2^e (FDI_t - FDI_{t-3}) + b_3^e RER_qoq_t + \delta^e e_{t-1}^e + \varepsilon_t^e,$$

where RER_qoq_t is the quarter-on-quarter change in the real exchange rate of the Slovak koruna based on the producer price index (PPI). The model of Slovak exports was estimated on data from the period 1996 Q1–2009 Q1. The results failed to confirm statistical significance of coefficient δ^e for the error correction term. Therefore, the model was estimated using only the first differences, with the following results:

$$\Delta EXP_t = -96.7 + 1.64 \Delta GDP_DE_t + 0.05 (FDI_t - FDI_{t-3}) + 1068.46 RER_qoq_t + \varepsilon_t^e$$

The signs of the estimated coefficients are in line with economic intuition. Growth in Slovak exports is positively affected by GDP growth in Germany, an increase in the stock of FDI or depreciation of the Slovak real exchange rate.

In the case of imports, the long-term cointegration relationship is estimated as:

$$IMP_t = c_0^i + c_1^i CONS_t + c_2^i GCF_t + c_3^i EXP_t + e_t^i,$$

where IMP_t are imports, $CONS_t$ is household consumption and GCF_t is gross capital formation. Using a similar approach as for exports, it is possible to find the cointegration relationship between these variables and use the lagged residuals as the error correction term in the equation for imports, which takes the following form:

$$\Delta IMP_t = b_0^i + b_1^i \Delta CONS_t + b_2^i \Delta GCF_t + b_3^i \Delta EXP_t + b_4^i RER_qoq_{t-4} + \delta^i e_{t-1}^i + \varepsilon_t^i.$$

¹⁵³ As these data were available only at yearly frequency between 1995 and 2000, cubic interpolation of the annual observations was applied to obtain quarterly data.

The model of Slovak imports was estimated on data for the period 1993 Q1–2009 Q1. However, the results failed to prove statistical significance of the coefficients for the change in the real exchange rate, even though different lags were tested. The resulting estimate of the equation for Slovak imports is the following:

$$\Delta IMP_t = -1068.2 + 0.67\Delta CONS_t + 0.43\Delta GCF_t + 0.91\Delta EXP_t - 0.43e_{t-1}^i + \varepsilon_t^i$$

The coefficients have the expected signs and confirm, among other things, a high import intensity of Slovak exports.

The estimated equations for Slovak exports and imports form a system of two equations with two endogenous variables and serve as a basis for simulating the effects of the fixing of the Slovak koruna in two scenarios. In the baseline scenario, the exogenous variables are set at their historical values. By contrast, the alternative scenario adjusts the path of the nominal exchange rate of the Slovak koruna, which as from 2008 Q3 is set according to the average depreciation of its neighbouring currencies – the Czech koruna, the Polish zloty and the Hungarian forint. Subsequently, the model is used to predict two different versions of the evolution of exports and imports for the period 2008 Q3–2009 Q1. The differences between the two versions represent the hypothetical effect of the fixing of the Slovak koruna on Slovak exports and imports.

1 CYCLICAL AND STRUCTURAL ALIGNMENT

1.1 Direct alignment indicators

1.1.1 Real economic convergence

The comparison of GDP per capita at purchasing power parity and the average price level of GDP is based on Eurostat data, derived from the International Comparison Program (ICP). The real exchange rate against the euro is based on the Harmonised Index of Consumer Prices. The annual rate of appreciation is calculated as the geometric mean of the appreciation since 1998.

The estimate of future appreciation over the next five years is based on two methods. Method 1 is based on a panel estimate, which links the price level of final consumption of households with GDP at purchasing power parity per capita for 32 European countries between 1995 and 2008 (see also Čihák and Holub, 2003 and 2005). The following relationship was estimated using a two-stage least-squares panel method with no fixed or random effects:

$$P_{C,t} = 31.12 + 0.71 GDP_{PPP,t} + 0.91 AR(1)_t,$$

where $P_{C,t}$ is the price level of final consumption of households in year t , $GDP_{PPP,t}$ is gross domestic product at purchasing power parity per capita in year t (in both cases EA-16 = 100) and $AR(1)_t$ is the first-order autoregressive term.¹⁵⁴ The simulations of the pace of equilibrium real exchange rate appreciation take as their starting point the estimates of GDP and the price level for 2009 based on European Commission and Eurostat forecasts for real GDP growth, nominal exchange rates and inflation in the individual countries in 2009. They also assume beta-convergence of GDP towards the level of the EA-16 at a rate of 3% a year. A range of estimates around the mean appreciation estimate is obtained by increasing or decreasing the

¹⁵⁴ A constant, $P_{C,t-1}$, $P_{C,t-2}$, $GDP_{PPP,t-1}$ and $GDP_{PPP,t-2}$ were used as the instrumental variables.

autoregressive coefficient by one standard error of its estimate (i.e. within a range of roughly 0.88–0.94).

Method 2 uses updated estimates of equilibrium real exchange rate appreciation for the Czech Republic, Hungary, Poland, Slovakia and Slovenia presented in an analysis by Brůha and Podpiera (2007). This analysis is based on a calibrated dynamic general equilibrium model for two unequally developed countries in which real appreciation is going on owing mainly to investment in product quality.

Real interest rates are derived from three-month money market interest rates. Three-month interest rates were selected for reasons of data availability in the Eurostat database for all monitored countries over the whole period under review; twelve-month interest rates would be more appropriate from the economic point of view, but the differences compared to the three-month rates are small on average (usually around 0.1–0.2 percentage point). The average annual level of interest rates is deflated by the average annual inflation rate for the country concerned, using the Harmonised Index of Consumer Prices. The estimate of real rates going forward is based on the assumptions of full elimination of the risk premium thanks to euro adoption and an equilibrium three-month real rate in the euro area of 1.8%. From this figure, the range of the estimates of equilibrium real appreciation for each of the countries (see above) is subtracted, corresponding to the future expected inflation differential vis-à-vis the euro area average.

1.1.2 Correlation of economic activity

The alignment of economic activity in the selected countries with the euro area is analysed using correlation analysis. Mutual relationships between individual countries and the euro area are assessed using the pairwise correlation coefficients applied to real GDP time series, industrial production indices (IPIs) and export indices.

The **simple (Pearson) correlation coefficient** is used to assess the strength of the linear relationship:

$$r_{xy} = \frac{s_{xy}}{\sqrt{\sigma_x^2 \sigma_y^2}},$$

where s_{xy} is the estimate of covariance and σ_x and σ_y are estimates of the standard deviation of time series x and y .

Simple correlations are calculated over a moving time window to obtain the **rolling correlation**. The corresponding time window for a given quarter is defined as the last 20 observations (5 years). The rolling correlation should help to reveal trends in alignment.

When examining alignment of the cyclical behaviour between selected economies in order to assess the impact of economic policy, it is appropriate to monitor the correlation only within a certain band. Cycles between one and a half and eight years long are considered most frequently. **Dynamic correlation**¹⁵⁵, which allows this requirement to be met, was therefore used as a third method. Dynamic correlation is based on spectral analysis of time series, takes values in the range [-1;1] and, analogously to the static correlation coefficient, is defined by the relationship:

¹⁵⁵ Croux, Forni and Reichlin (2001).

$$\rho_{xy}(\lambda) = \frac{C_{xy}(\lambda)}{\sqrt{S_x(\lambda)S_y(\lambda)}},$$

where $S_x(\lambda)$ and $S_y(\lambda)$ are spectral density functions and $C_{xy}(\lambda)$ is a cospectrum, while λ takes values in the range $[-\pi;\pi]$. The simple static correlation is then a function (approximately the average) of the dynamic correlations across the entire observed spectrum.

The analysis uses quarterly real GDP time series at 2000 constant prices (expressed in national currencies), monthly time series of the Industrial Production Index adjusted for working days, and monthly or quarterly time series of total exports and exports to the euro area expressed in the national currency. The source of the GDP and IPI data is Eurostat; the export data are obtained from the IMF database.

As in previous years, results for Portugal are not included in the analysis of real GDP correlation, since no comparable data are available for the country. Export data are available only in USD from the IMF database, so they had to be converted into national currencies. Average monthly or quarterly exchange rates according to the IMF were used for the conversion.

Time series are expressed in logs, seasonally adjusted and detrended. As the literature¹⁵⁶ does not offer a consensus on the optimal detrending method, the analysis applies two different detrending methods – namely year-on-year differences between the original time series and quarter-on-quarter (month-on-month) differences between the seasonally adjusted time series:

Method 1

Year-on-year differences in the seasonally unadjusted (log) time series are given by:

$$\ln y_t - \ln y_{t-s},$$

where y denotes the variable under investigation, t is the time period and s is seasonality ($s = 4$ for quarterly data, $s = 12$ for monthly data).

Method 2

The correlation of economic activity can also be analysed using quarter-on-quarter or month-on-month changes in the seasonally adjusted time series ($\ln y_{sa,t}$):

$$\ln y_{sa,t} - \ln y_{sa,t-1},$$

where y_{sa} is seasonally adjusted using the TRAMO/SEATS method.

In most cases, it is possible – based on the resulting time series – to conclude that the above methods succeed in detrending. As regards GDP in the Czech Republic or Slovakia, the results are not entirely clear. However, the shortness of the time series makes it impossible to check reliably whether the resulting series are stationary. Moreover, the same detrending method has to be used for all the series under review to maintain comparability.

Given the requirement to assess the development in the alignment of the business cycles of individual countries vis-à-vis the euro area, correlation coefficients (both static and dynamic), with respect to the quarterly real GDP time series are calculated separately for two time periods: 1997 Q1–2001 Q4 and 2002 Q1–2009 Q1. An analysis using rolling correlations was prepared as an alternative to the breakdown into two periods. As the time series of the

¹⁵⁶ For example, Frankel and Rose (1997). The features of the individual methods are described in Canova (1998).

Industrial Production Index begin at different points in time for different countries, the periods are defined as January 1999–December 2001 and January 2002–April 2009 in this case. Relatively long time series are available for export data, so it was possible to calculate all correlation coefficients for two periods as in the case of GDP. Specifically, these periods are 1997 Q1–2001 Q4 and 2002 Q1–2008 Q4 for quarterly data, and January 1997–December 2001 and January 2002–January 2009 for monthly data. The choice of intervals was motivated by maximum possible unification to make the results mutually comparable.

1.1.3 Analysis of cyclical alignment using the Taylor rule

The implied monetary policy interest rate for the countries under comparison and the euro area is estimated using the classic Taylor rule (Taylor, 1993).¹⁵⁷ In contrast to the more complicated variants, the advantage of the basic version of this rule is that it works only with current output gap values and the deviation of inflation from the target. Equilibrium real interest rates are added as an exogenous variable. This rule is generally regarded as relatively realistically capturing the behaviour of central banks over the medium term and at the same time being highly robust.

Implied monetary policy rates for country X are derived from the Taylor rule as:

$$X_TR_t = \pi_{X,t} + \frac{1}{2} y_{X,t} + \frac{1}{2} (\pi_{X,t} - \pi_X^*) + r^{eq},$$

where π_t is the inflation rate, y_t the output gap (derived using the Hodrick-Prescott (HP) filter),¹⁵⁸ π_t^* the inflation target and r^{eq} equilibrium rates.

The time series of seasonally adjusted GDP, three-month money market rates¹⁵⁹ and the HICP are taken from Eurostat's database. The time series of monetary-policy relevant inflation in the Czech Republic is obtained from the CNB's database. As in Taylor (1993), equilibrium real interest rates and the inflation target are 2%. The comparison therefore assumes that the equilibrium rates and the inflation target are the same in all countries. Although the inflation targets in some non-euro area countries are different (usually higher), the assumption of a common target is motivated by the prospect of their adopting the single ECB monetary policy in the future.¹⁶⁰

The sums of the squares of the deviations of country X from the implied rate for the whole euro area (*EA*) are calculated as:

¹⁵⁷ Estimating the reaction rules of central banks is a complex task. The more sophisticated reaction functions are forward-looking, but their estimation is rather complicated. Although a simple backward-looking rule (like the Taylor rule) is cruder, it can be directly interpreted as a statistic of the current cyclical position of the economy. However, the disadvantage of this simple rule is the fact that current inflation can also include the effects of temporary shocks (e.g. due to changes in regulated prices) which are non-cyclical (exogenous) and/or one-off in nature and to which central banks either cannot respond in time or do not want to respond at all (and apply escape clauses, for example).

¹⁵⁸ When interpreting the results, we must bear in mind that the HP filter is merely an approximate and imperfect method of estimating the output gap.

¹⁵⁹ The analysis also presents the deviation of the actual rate from the implied euro area rate. The annualised 3M EURIBOR rate is used to proxy for the actual rate.

¹⁶⁰ The common inflation target for the euro area can implicitly mean a different inflation target for each economy according to its specific rate of equilibrium real appreciation.

$$S_x = \sum_i (X_TR_i - EU_TR_i)^2.$$

The calculation has changed compared to last year and the deviations are calculated in percentage points from the euro area implied rates.

It follows from this relationship that $S_{EA} = 0$. To follow developments over time, S_x is calculated for five different periods: 1999 Q1–2009 Q1, 2001 Q1–2009 Q1, 2003 Q1–2009 Q1, 2005 Q1–2009 Q1 and 2007 Q1–2009 Q1.

1.1.4 Synchronisation of economic shocks

A bi-variate structural vector autoregressive (SVAR) procedure is applied to identify demand and supply shocks (see Blanchard and Quah, 1989; Bayoumi and Eichengreen, 1993; and Babetskii, 2004 and 2005). Quarterly seasonally adjusted GDP series at constant prices and the GDP deflator in selected new EU countries (Czech Republic, Hungary, Poland, Slovakia and Slovenia) and current euro area members (Germany, Portugal and Austria) are the inputs for the SVAR model. The source of the data is Eurostat and the data cover the period 1996 Q1–2009 Q1.

This method identifies supply and demand shocks in the following way. First, the shocks with and without a lasting impact on GDP are identified. Using an over-identifying restriction, it is subsequently verified whether contrary movements in GDP and the price level occur for the former shocks. Where this condition is met, the shock can be regarded as a supply shock. For shocks without a lasting impact on GDP it is verified whether co-movement of GDP and the price level occurs. Such a shock is then considered a demand shock. The calculation of the correlation of shocks between the group of new EU Member States and the current euro area members and the whole EA-16 indicates the degree of asymmetry of shocks vis-à-vis the euro area.

1.1.5 Macroeconomic effects of financial flows from EU funds

The analysis of the macroeconomic effects of financial flows from the EU funds is based on Ministry of Finance working estimates of financial flows between the Czech Republic and the EU in 2009–2013, which are expressed in euros. They have been converted to Czech korunas using the outlook for the CZK/EUR exchange rate according to the CNB's macroeconomic forecast published in Inflation Report III/2009. Data on actual financial flows between the Czech Republic and the EU in 2005–2009 H1 are taken from the Ministry for Regional Development.

The macroeconomic effects of flows from the EU funds are simulated using the quarterly prediction model (QPM).¹⁶¹ The simulation takes the form of a demand shock facing the economy, with the additionally identified impulse from the inflow of EU funds being inserted into the output gap equation. The macroeconomic effects are expressed as deviations of the monitored indicators from the path they would follow if the demand impulse were zero.

The **additional economic impulse** from flows of EU funds is derived from the actual volumes drawn by the private sector from EU funds. In the past, the private sector was primarily a recipient of funds from the Sapard and Phare pre-accession instruments (their drawdown has now terminated in the Czech Republic). Since 2004 it has also received funds

¹⁶¹ For further details on this model, see Beneš et al. (2003).

for support of agriculture, approximately 70% of the funds for projects from the Structural Funds and funds for internal policies. Where the public sector is the recipient, these funds are part of the government sector's balance and do not pose an additional risk to the CNB's macroeconomic forecast,¹⁶² as they are already accounted for in its baseline scenario. These funds include the income from the Cohesion Fund and the ISPA pre-accession instrument,¹⁶³ which is aimed at large infrastructure projects and environmental protection projects. In the past, budget compensations represented direct revenue of the state budget.

Actual drawing on the Structural Funds between 2005 and 2009 H1 is derived from realised expenditure, or submitted payment requests,¹⁶⁴ as reported by the Ministry for Regional Development in the document "The Course of Drawdown of Structural Funds" for 2004–2006 and in the "Monthly Monitoring Report on Drawdown of Structural Funds, the Cohesion Fund and National Resources" for 2007–2013.¹⁶⁵ The forecast for realised expenditure in 2009–2013 is an expert estimate by the CNB. To estimate actual drawing on the Structural Funds, advance payments as yet not used to finance implemented projects are excluded from the expected flows from the EU funds. By contrast, actual drawing on the Structural Funds and the Cohesion Fund is taken into account. The estimates consider the potential non-existence of a long lag between project implementation and the subsequent submission of the payment request by the final beneficiaries. In the case of direct payments under the Common Agricultural Policy, the financial flows are shifted one year back for the purposes of the simulations, as they are in fact paid with a lag of one year. As regards the drawdown of other EU funds (relating to internal policy and other areas of agriculture), it is assumed that they will broadly correspond to the expected financial flows.

The additional impulse due to the inflow of money from EU funds is derived from the annual change in additional revenue from the EU as a percentage of GDP, multiplied by an estimated multiplier. The data on Czech GDP in 2009–2013 are taken from the CNB's forecast published in Inflation Report III/2009.

1.1.6 Structural similarity of the economies

The structural similarity of the economies is compared using the Landesmann structural coefficient. The coefficient is calculated by comparing the shares of individual sectors, e.g. industry or construction, in total value added in country A (in our case, the Czech Republic, Germany, Austria, Portugal, Hungary, Poland, Slovenia and Slovakia) vis-à-vis country B (i.e. the EA-16). The difference between the shares is weighted by the share of the sector in country A in the total, and the weighted shares are then summed.

The calculation of the coefficient can be expressed formally as follows:

$$SL = \sum_{i=1}^n \sqrt{(sh_A^i - sh_B^i)^2} \cdot \left(\frac{sh_A^i}{100} \right),$$

¹⁶² The CNB's macroeconomic forecast is prepared using the g3 model.

¹⁶³ The ISPA instrument was the predecessor of financial aid from the Cohesion Fund in the period before the Czech Republic's accession to the EU.

¹⁶⁴ Realised expenditure, or submitted payment requests, includes funds applied for in the payment requests submitted by final beneficiaries to the intermediate body.

¹⁶⁵ www.strukturalni-fondy.cz

where sh_A^i is the percentage share of the i -th sector in value added as a whole in country A and sh_B^i is the percentage share of the i -th sector in value added as a whole in country B. The calculation is performed separately for each selected period. In our case, it is based on annual data. The source of the data is Eurostat. The structure of the coefficient is described in detail in Landesmann (1995) and also in Flek et al. (2001).

For the purposes of the analysis the coefficient was modified to $SL/100$.¹⁶⁶ Adjusted in this way, the coefficient takes a value in the range $[0;1]$. The closer the coefficient is to zero, the more similar in structure are the economies.

1.1.7 Interest rate convergence

The simple method of a chart showing the interest rate differential vis-à-vis the euro area is used to analyse interest rate convergence in the Czech Republic, Hungary, Poland, Slovenia and Slovakia.¹⁶⁷ Eurostat data (three-month money market rates) and Bloomberg data (five-year government bonds) were used to measure the interest rate differentials between three-month and five-year rates in the euro area and these countries. The euro area comprises 11 countries until the end of 2000, 12 countries until the end of 2006, 13 countries until the end of 2007, 15 countries until the end of 2008 and 16 countries from January 2009.

The time series of three-month interest rates starts in January 1998 for all of the countries monitored, excluding Slovenia, whose time series starts in May 1998. The time series of five-year interest rates starts in January 1998 for the euro area¹⁶⁸, the Czech Republic and Hungary, March 1999 for Poland, February 2002 for Slovakia and August 2005 for Slovenia. The time series terminate in May 2009 for three-month rates and June 2009 for five-year rates.

The time series “EMU convergence criterion bond yields” from the New Cronos database (Eurostat) were used to compare 10Y government bond yields.¹⁶⁹ These time series are based on the gross yield on government bonds on the secondary market with approximately ten years to maturity. A weighted yield is created by Eurostat for the euro area, in which the weights applied are the nominal stocks of government bonds in each country. For the period before 1999, the weights are based on national GDP in purchasing power parity. The compared data cover the period between January 1990 and May 2009 and are published monthly.

1.1.8 Exchange rate convergence

Aguilar and Hördahl (1998) express the probability of adoption of the euro by eleven EMU candidate countries using the correlation of the exchange rates of their currencies and the

$$SL = \sum_{i=1}^n \sqrt{\left(\left(\frac{I_{sh_A^i} \cdot 100}{I_{sh_B^i} \cdot 100} - I_{sh_B^i} \cdot 100 \right)^2 \cdot \left(\frac{I_{sh_A^i} \cdot 100}{100} \right)^2 \right)} = 100 \sum_{i=1}^n \sqrt{\left(\frac{I_{sh_A^i} - I_{sh_B^i}}{I_{sh_A^i}} \right)^2 \cdot I_{sh_A^i}} = 100 \cdot I_{SL}$$

In this case, indices are used rather than the percentage shares of individual sectors in the total.

¹⁶⁷ Interest rate convergence can be examined using the unit root test (see, for example, Lee and Wu, 2004, and Kočenda, 2001). However, the analyses must take into account the relatively short length of the available time series, as well as breaks in the time series.

¹⁶⁸ The source is Bloomberg – Euro Generic Government Bond time series.

¹⁶⁹ These interest rates are monitored under the Maastricht convergence criterion on long-term interest rates.

Deutsche Mark (as a substitute for the euro) vis-à-vis the US dollar.¹⁷⁰ The exchange rates of the two currencies are thus expressed in terms of the currency of a third country which is not an EMU member. The correlation between the movements of two currencies in a monetary union should by definition equal 1; therefore, a higher correlation means higher probability of participation in the EMU.

The analysis in this document uses the same method to assess how close the Czech Republic, Hungary, Poland, Slovakia and Slovenia are to adopting the euro.

The correlation coefficient is based on a GARCH estimate and is calculated according to the following formula:

$$corr_t = \frac{\text{cov}(X/USD, EUR/USD)_t}{\sqrt{\text{var}(X/USD)_t * \text{var}(EUR/USD)_t}}, \text{ where } X \text{ represents the national currencies.}$$

This method returns a correlation coefficient which changes over time and therefore provides more information than a simple correlation coefficient of the exchange rate of the national currency against the euro. Moreover, the use of the GARCH technique allows all the information in the data to be utilised. A higher GARCH correlation means similar developments in exchange rate volatility, which can be interpreted as synchronisation of exchange rate shocks in the countries under review.

The analysis covers the period from 1 January 1998 to 13 July 2009 and uses daily data from Thomson Datastream and Eurostat.

1.1.9 Analysis of exchange rate volatility

The historical exchange rate volatility is calculated as a standard deviation of logarithmic daily returns for a period of six months:

$$\sigma = \sqrt{\frac{1}{T-1} \sum_{t=1}^T (r_t - \bar{r})^2},$$

where σ is the standard deviation, r_t is the daily return and T is the number of working days in the period of six months (126 for a year with 252 working days). We use the following relationship to translate the standard deviation of logarithmic daily returns to an annualised form:

$$\sigma_{ann} = \sigma \sqrt{N}, \text{ where } N=252 \text{ represents the approximate number of business days in the year.}$$

The historical volatility of the exchange rates of the countries under comparison against the euro is calculated using exchange rates announced by the CNB.

The implied volatility is derived from market prices of options using the given valuation model. This volatility is directly quoted in the trading system. The source of the data is Bloomberg, and the index codes are EURCZKV6M, EURSKKV6M, EURPLNV6M and EURHUFV6M.

The fundamental-based exchange rate volatility ($FVOL_{ij}$) is calculated as a weighted average of the selected economic values describing the alignment between the analysed countries and the euro area:

¹⁷⁰ The same method is used in Castrén and Mazzotta (2005).

$$FVOL_{ij} = \alpha + \beta OPENNESS_{ij} + \chi FIN_{ij} + \mu DISSIM_{ij} + \rho TRADE_{ij},$$

where $OPENNESS_{ij}$ describes the openness of the economies, FIN_{ij} financial development, $DISSIM_{ij}$ dissimilar commodity structure of exports compared to the euro area and $TRADE_{ij}$ integration of international trade. The respective weights ($\alpha, \beta, \chi, \mu, \rho$) are assumed based on the estimates in Horváth (2005), as well as the methodology of calculation of the above economic variables. The justification of selection of the respective economic variables can be found in Bayoumi and Eichengreen (1997) and Horváth (2005).

As the calculation of the fundamental-based volatility is based on quarterly economic data, the historical exchange rate volatility used for comparison with the fundamental-based volatility is calculated using quarterly data in 1999–2008 as follows: $VOL_{ij} = SD[\Delta(\log e_{ij})]$, where SD is the standard deviation of the quarter-on-quarter change (Δ) in the logarithm of the nominal rate (e_{ij}) between countries i and j . The fundamental-based and historical volatilities are then translated to their annualised value in accordance with the above formula.

1.2 Effect of international economic relations

1.2.1 Integration of the economy with the euro area

The data for the calculation of the shares of exports to and imports from the euro area in total exports and imports are taken from the Direction of Trade Statistics database of the International Monetary Fund (1998–2008 annual data) and from Eurostat (2009Q1).

The source of data for the analysis of the euro area's share in direct investment is the Eurostat database, for Austria the OeNB, for Germany the Bundesbank and for Hungary the MNB. Data on the inflow of foreign direct investment (FDI) from euro area countries and the outflow of direct investment (DI) to euro area countries were used. The presented time series does not start until 2002 owing to the availability and quality of the data compared. The GDP data are from Eurostat.

1.2.2 Intra-industry trade

The Grubel-Lloyd (GL) index was used to analyse intra-industry trade:

$$GL_t = 1 - \frac{\sum_k \sum_i |X_{it}^k - M_{it}^k|}{\sum_k \sum_i |X_{it}^k + M_{it}^k|}$$

GL_t is the ratio of the absolute value of intra-industry trade to foreign trade turnover. X_{it}^k and M_{it}^k denote exports to and imports from the k -th country of the i -th commodity at time t . The index takes values ranging from 0 to 1. A value of 0 means that all trade is inter-industry trade and that there is specialisation in different commodities. By contrast, a value of 1 indicates that all trade is intra-industry trade (Flek et al., 2001).

The GL index is calculated using data on total exports and imports to and from the euro area in the countries under review.¹⁷¹ To calculate the index, foreign trade is broken down on the

¹⁷¹ As the trade balances of euro area countries can take either positive or negative values, it is recommended to calculate the aggregated Grubel-Lloyd index using bilateral export and import flows.

basis of the SITC and CN8 classifications (the commodities i are thus given by SITC groups at the one- to five-digit level and CN8 at the eight-digit level). The data source is the Eurostat COMEXT database. Mirror trade flows were used for 1998, i.e. data on imports (exports) of euro area countries from (to) the monitored countries were used for exports (imports) of the monitored countries to (from) euro area countries.

The value of the GL index depends, among other things, on the level of detail of the branch breakdown. The breakdown according to the one- or two-digit SITC is a rather broader sector breakdown which may put together in one category branches whose output is not closely related. This is particularly so in SITC 7 (Machinery and transport equipment), resulting as expected in a higher value of this indicator for all countries (see Chart 15 in section D and Table E.1). Although the qualitative message of the analysis is relatively independent of the degree of aggregation selected, the cross-country differences are largest when using the eight-digit (most detailed) breakdown.¹⁷²

Table E.1: Grubel–Lloyd index for 2008 by degree of aggregation

	SITC 1	SITC 2	SITC 3	SITC 5	CN8
CZ	0.82	0.71	0.61	0.46	0.40
AT	0.76	0.69	0.63	0.47	0.42
DE	0.77	0.69	0.62	0.49	0.45
PT	0.67	0.58	0.49	0.35	0.31
HU	0.78	0.67	0.57	0.37	0.33
PL	0.77	0.62	0.51	0.36	0.32
SI	0.74	0.62	0.47	0.32	0.28
SK	0.80	0.65	0.48	0.32	0.28

Notes: SITC 1, 2, 3 and 5 represent the one-, two-, three- and five-digit breakdowns according to the SITC classification. CN8 corresponds to the eight-digit breakdown.

Sources: Eurostat, CNB calculations.

The Gruber-Lloyd index for horizontal and vertical intra-industry trade is calculated on the basis of the following formulas and using the methodology described in Fontagné and Freudenberg (1997) and Fontagné et al. (2006):

$$GL_t^H = 1 - \frac{\sum_k \sum_i |X_{it}^{H,k} - M_{it}^{H,k}|}{\sum_k \sum_i |X_{it}^{H,k} + M_{it}^{H,k}|} \quad GL_t^V = 1 - \frac{\sum_k \sum_i |X_{it}^{V,k} - M_{it}^{V,k}|}{\sum_k \sum_i |X_{it}^{V,k} + M_{it}^{V,k}|}$$

where H and V represent categories of goods defined as horizontal and vertical. In other words, the ratio of intra-industry trade in goods of similar (different) quality to total trade in goods of similar (different) quality was used to calculate the GL index for horizontal (vertical) intra-industry trade. Unit values are used to proxy for the quality of goods. Trade for a given category of goods is considered horizontal if the share of the unit value of exports (UVX_{ij}^k) in the unit value of imports (UVM_{ij}^k) for this category does not exceed 25%, i.e.:

$$\frac{1}{1.25} \leq \frac{UVX_{it}^k}{UVM_{it}^k} \leq 1.25$$

¹⁷² The simplest calculation of the Gruber-Lloyd index, using SITC 1, is based on 10 categories. According to the CN8 classification, however, the Czech Republic imported around 9,000 categories of goods from the euro area in 2008 and exported more than 8,100 categories of goods.

Otherwise, trade is regarded as vertical. As the data used to calculate the unit values need to be as detailed as possible, the eight-digit CN8 classification and data on trade with individual euro area countries were used. One-way trade is excluded from the identification of horizontal and vertical trade as a result of the definition used.

The share of a given type of trade in total trade with the euro area (see Table 18 in section D) is calculated as the sum of exports and imports of goods included in horizontal (vertical) trade relative to total exports and imports (values listed in the “TOTAL” line in the Eurostat database). The difference between total foreign trade turnover and the sum of horizontal and vertical trade consists of one-way trade and measurement errors.

1.3 Financial market

1.3.1 Financial system

Financial system assets/GDP (ratio of net book value of financial sector assets to GDP at current prices) – expresses the asset strength of intermediation by banks and non-bank financial institutions: insurance corporations, pension funds, credit unions, investment companies and investment funds (unit trusts), financial leasing corporations and other financial corporations (forfeiting and factoring companies, investment firms, bureaux de change, etc.). Generally speaking, the more advanced the market, the larger the assets and the deeper the financial intermediation relative to GDP.

The method of calculation of the ratios can include assets provided to both residents and non-residents. For the purposes of economic interpretation, it is appropriate also to analyse the share of residents’ assets alone.

Bank loans to non-bank clients/GDP (ratio of gross book value of loans to non-bank clients, corporations and households to GDP at current prices) – expresses the depth of financial intermediation by banks. Loans to both residents and non-residents present the business dimension of financial intermediation.

For the purposes of economic interpretation it would be more appropriate to use the ratio of loans granted to residents, which forms part of the monetary survey and macroeconomic analyses. However, it is sometimes difficult to exclude loans to the government, which are usually included in client loans.

Banking sector assets/financial system assets – expresses the share of the banking sector in the financial system of the country and at the same time banks’ financial intermediation potential. In general, the more advanced the market, the larger the assets and the deeper the financial intermediation by non-bank financial institutions, which at the same time are usually internalised in strong bank and non-bank financial groups.

Structural change over time is important for economic interpretation – the share of banks in the financial system usually declines in developing market economies (unless one takes into account the formation of bank financial groups).

Loans to households in the Czech Republic mostly include debit balances on current accounts and balances on credit accounts of natural persons, i.e. loans to individuals (residents) and loans to small businesses (residents), as well as loans to non-profit institutions serving households (e.g. housing co-operatives).

1.3.2 Structure of financial assets and liabilities of corporations and households

Financial accounts data published by Eurostat and national central banks are used as the input data for the analysis of the alignment of the structure of corporations' and households' financial assets and liabilities. The analysis differentiates between five main types of financial assets and liabilities: currency and deposits, securities other than shares, loans, shares and other equity, and remaining accounts receivable. These are stock variables pertaining to a given point in time.

Financial assets and liabilities are defined as follows. Currency and deposits consist of currency in circulation and all types of deposits in national and in foreign currency. Securities other than shares comprise debt securities that do not grant the holder any ownership rights in the institutional unit issuing them. Loans represent interest-bearing debt to creditors that has to be repaid at maturity. Shares and other equity are property rights on corporations. They generally entitle the holders to a share in the corporation's profits and to a share in its net assets in the event of liquidation. Remaining accounts receivable/payable consist of insurance technical reserves and other accounts receivable/payable. Insurance technical reserves are products of insurance companies and pension funds. Other accounts receivable/payable comprise financial claims which are created as counterparts to financial or non-financial transactions in the event of a time mismatch between the transaction and the corresponding payment. They comprise trade credits and advances, and accounts receivable/payables not elsewhere classified. Data are not available on the financial assets and liabilities of households and corporations in Poland.

Indebtedness of non-financial corporations – loans and debt securities issued/GDP – this indicator shows the depth of corporations' indebtedness. It is an important factor affecting the sensitivity of investment to interest rate movements. An interest rate increase forces corporate debtors to spend a higher proportion of their outgoings on interest payments, which has the immediate effect of reducing further investment, and vice versa. A higher degree of development of the financial system usually leads, *ceteris paribus*, to a rise in corporate indebtedness.

Indebtedness of households – loans from banks and non-bank institutions/GDP – this indicator shows the level of indebtedness of households. Given the role of households as consumers and as depositors of savings in the financial system, a change in their behaviour caused by a high debt burden can have a significant impact on real economic activity and on the financial system as a whole. Adjustment (i.e. growth) towards the levels of indebtedness seen in advanced economies usually takes place in emerging economies.

1.3.3 Effect of monetary policy on client interest rates and the volume of new loans

Interest rate sensitivity of new loans to non-financial corporations and loans for house purchase – this indicator shows the degree of structural similarity of new loans in terms of interest rate fixation between the Czech Republic, the euro area average and the countries under review. For the single monetary policy to operate effectively, it is important that the interest rate sensitivity of these loan types to changes in market and client interest rates is similar, thereby eliminating some asymmetry in the event of economic shocks.

Convergence of interest rates on loans to non-financial corporations and loans for house purchase – a chart showing the interest rate differential vis-à-vis the euro area is used to analyse convergence of interest rates in the Czech Republic and the countries under review to

the euro area average. The differential shows the difference between interest rates on loans to non-financial corporations and loans for house purchase in the Czech Republic and in the countries under review and analogous average rates for the two loan types in the euro area. Average weighted interest rates on new business, which reflect the rates agreed for all new business during the month, were used in the calculation.

Interest burden – the degree of alignment of the effects of interest rate changes on the financial situation of non-financial corporations and households was identified using an indicator showing the interest burden on these two sectors, i.e. what proportion of profit or gross disposable income is used to pay interest. From the viewpoint of the monetary policy transmission mechanism, a higher debt burden is usually accompanied by a higher interest burden, which increases the risk to debt sustainability in the event of negative shocks to income and interest rates. This can ultimately have a negative effect on the consumption and investment expenditure of economic agents. Some trend synchronisation of this indicator in the Czech Republic with the euro area average is important to enable the single monetary policy to influence the balance sheets of corporations and households effectively.

1.3.4 Spontaneous euroisation

Euroisation is the process of substitution of a domestic currency with a foreign one (the euro) to ensure the necessary functions of money as a medium of exchange and a store of value. Generally, official and unofficial (spontaneous) euroisation can be distinguished. This analysis is concerned with spontaneous euroisation, which is important for assessing the efficiency and effectiveness of independent monetary policy. A comparison of the level of euroisation in the Czech Republic and selected Central European countries, namely Poland, Hungary and Slovakia, and an assessment of the initial effects of the escalating financial crisis on the degree of euroisation were performed using a survey conducted by Oesterreichische Nationalbank on the cash holdings and savings deposits of households in the autumn of 2008.

1.3.5 Financial market integration

1.3.5.1 Price-based measures

For quantification of beta-convergence, common regression analysis or the panel estimation method is applied (as in Babetskii et. al., 2007), in the form of the equation:

$$\Delta R_{i,t} = \alpha_i + \beta R_{i,t-1} + \sum_{l=1}^L \gamma_l \Delta R_{i,t-l} + \varepsilon_{i,t},$$

where $R_{i,t} = Y_{i,t} - Y_{i,t}^B$ is the difference between the asset yields of country i ¹⁷³ and a selected reference territory (a benchmark, B) at time t , Δ is the difference operator, α_i is a dummy variable for the respective country, L is the maximum lag and $\varepsilon_{i,t}$ is a random term. The size of coefficient β may be interpreted as a direct measure of the convergence speed. A negative beta coefficient indicates the occurrence of convergence. The β coefficient can take values ranging from -2 to 0. The closer the value of the β coefficient to 1, the higher the speed of convergence. If $\beta = -2$ or $\beta = 0$, no convergence is observed. β values from -1 to 0 indicate monotonous convergence, while oscillating convergence occurs for values from -2 to -1.

¹⁷³ $Y_{i,t} = \left[\ln(A_{i,t}) - \ln(A_{i,t-1}) \right]$, where Y denotes the yield on the relevant asset, A the price index of the relevant asset (expressed as a basic index) and i the individual country.

For quantification of sigma-convergence, a calculation is used of the (cross-section) standard deviation (σ), according to the formula:

$$\sigma_t = \sqrt{\left(\frac{1}{N}\right) \sum_{i=1}^N [\log(Y_{i,t}) - \log(\bar{Y}_t)]^2}$$

where Y is the asset yield, \bar{Y}_t is the mean value of the yield over time t and i stands for the individual countries ($i = 1, 2, \dots, N$). For the purposes of this analysis, we introduce $N = 2$, i.e. we examine the evolution of sigma-convergence over time between the euro area and one of the countries under review.¹⁷⁴ σ takes only positive values in theory. The lower is σ , the higher is the level of convergence. In theory, full integration is achieved when the standard deviation is zero,¹⁷⁵ while high (several digit) values of σ reflect a very low degree of integration. For graphical illustration, the results were normalised over the whole time period and filtered using the Hodrick-Prescott filter with the recommended weekly time series coefficient $\lambda = 270,400$.

1.3.5.2 News-based measures

Quantification of the degree of shock integration can be estimated (as in Baele et al., 2004) for the money, foreign exchange and government bond markets using the following regression:

$$\Delta Y_{i,t} = \alpha_{i,t} + \gamma_{i,t} \Delta Y_{b,t} + \varphi_{i,t}$$

where $Y_{i,t}$ represents individual asset yields in country i at time t , and b denotes the benchmark country (Germany for the government bond market, otherwise the euro area). $\alpha_{i,t}$ is a specific constant for each country, Δ denotes the difference operator and $\varphi_{i,t}$ is a random term. An increase in this type of integration requires α to converge to zero, γ to converge to one and the proportion of the variance of coefficients γ (for benchmark and national assets) to be close to one. The time-varying parameters γ were estimated using recursive estimation.

To quantify the degree of stock market shock integration between the countries under review and the euro area, the above equation must be adjusted for the impact of the US stock market on the monitored markets and the euro area market. This is due to the lower comparability of the individual national stock indices relative to the other monitored assets (exchange rates, money market rates and government bonds). The modified equation for the stock market has the following form:

$$\Delta Y_{i,t} = c_{i,t} + \gamma_{i,t}^b \Delta Y_{b,t} + \gamma_{i,t}^{US} \Delta Y_{us,t} + v_{i,t}$$

The magnitude of parameters γ expresses the degree of identical response of an asset of a selected country and a comparable benchmark asset to certain news.

¹⁷⁴ For pairs of countries, the calculated values in each period are essentially equal to half the square of the yield differential.

¹⁷⁵ This occurs on the money and foreign exchange markets for countries entering the euro area on a given date.

Data

The calculations for both measures of financial integration were carried out using weekly data (daily data averages) from Thomson Datastream, covering the period January 1995 to June 2009 for the foreign exchange and stock markets, January 1999 to June 2009 for the money market and January 2001 to June 2009 for the bond market. Three-month interbank rates were used for the money market, national currencies quoted against the US dollar for the foreign exchange market, five-year government bonds for the bond market and national stock indices for the stock market (see Table E.2). The relevant time series were adjusted for exchange rate effects.

Table E.2: Data sources

	Money market	Foreign exchange market	Bond market	Stock market
	1999–2009	1995–2009	2001–2009	1995–2009
CZ	PRIBK3M	PRUSDSP	BMCZ05Y-(RY)	CZPXIDX
AT	-	-	BMOE05Y-(RY)	ATXINDX
DE	-	-	BMBD05Y-(RY) ^{b)}	DAXINDX
PT	-	-	BMPT05Y-(RY)	POPSI20
HU	HNIBK3M	HNUSDNB	BMHN05Y-(RY)	BUXINDX
PL	POIBK3M	POUSDSP	BMPO05Y-(RY)	POLWIGI
SI	-	SJUSDSP	-	SLOESBI
SK	SXIBK3M	SXUSDSP	SXGOVT1-(RY) ^{a)}	SXSAX16
EA-16	BBEUR3M ^{b)}	USECBSP ^{b)}	-	DJES50I ^{b), b)}
USA	-	-	-	S&PCOMP

Notes: Thomson Datastream codes.

^{b)} – benchmark.

^{a)} – data from 2002 onwards.

^{b)} – DJES50I consists of stocks from euro area member countries with the following weights: France 34.6%, Germany 28.0%, Spain 16.7%, Italy 11.0%, the Netherlands 5.6%, Finland 2.5% and Luxembourg 1.7%.

Source: Thomson Datastream.

2 ADJUSTMENT MECHANISMS

2.1 Fiscal policy

2.1.1 Stabilising function of public budgets

Decomposition of the fiscal deficit into the cyclical and structural component

The general government fiscal balance (deficit or surplus) inherently reflects both the intended effects of fiscal policy and the effect of the business cycle. The effect of the current phase of the business cycle manifests itself in the collection of direct and indirect taxes and some cycle-sensitive expenditure items, such as unemployment-related outlays. The assessment of fiscal policy therefore usually focuses on the cyclically adjusted component of the general government balance, as that component is controlled by the public sector.

The overall general government balance can therefore be divided into a cyclical component and a cyclically adjusted component. The so-called structural balance is used for more precise assessment of the government's fiscal policy stance in a given period. It is based on the cyclically adjusted component of the budget balance but in addition to the economic cycle it reflects the impact of temporary and one-off measures that are not immediately related to the

long-term orientation of fiscal policy (for example revenue from the sale of emission allowances abroad and expenditure connected with floods or lost arbitrations).

Two approaches were used to estimate the cyclical component.

The first approach builds on the methodology used by the European Commission and other international institutions (OECD, IMF) and is based on the relationship between the output gap and revenue/expenditure budgetary items which are subject to cyclical developments.

The second method, introduced by the ECB at the level of the European System of Central Banks (ESCB), calculates the cyclical component using a different approach. This is because public budget items are in fact linked to specific components of GDP rather than to GDP as a whole. The ECB therefore uses a methodology in which key budget items affected by the economic cycle are always related to specific indicators of economic activity and the labour market known as bases (wages and salaries, employment, operating surplus, private consumption and unemployment). The cyclical component of public budgets in a given year is then determined as the difference between the sum of the partial cyclical components of four key tax revenues (personal income tax, corporate income tax, indirect taxes and social security contributions) and one expenditure item sensitive to the economic cycle (unemployment benefits).

The ECB's method has the undeniable analytical advantage that it reflects the actual determinants of public finance and enables further analysis of those determinants. By contrast, the Commission's method based on estimating the output gap is able to capture the change in the evolution of the economy in the form of a cyclical component usually faster than the approach used by the ECB, since its calculation is based directly on the change in output not in labour market variables, which respond to fluctuations in economic activity with a lag. The results of the two methods naturally differ over time and from each other. Bear in mind that both methods are by their very nature mere approximations of two unobserved components of the budget balance (the cyclical component and the cyclically adjusted balance) and their main objective is to determine the position and the underlying trend in their development.

2.1.2 Government deficit and debt and the scope for stabilising fiscal policy

All the debt and deficit figures are based on the ESA 95 methodology, which is the key methodology with regard to considerations of euro area accession, except for the part of the table covering mandatory expenditures in the Czech Republic, which also includes figures from the state budget, which is monitored on a cash (non-accrual) basis.

The description of mandatory expenditures is based on the definition used by the Ministry of Finance. These include mandatory expenditures arising from statutory requirements and other mandatory expenditures (namely expenditure arising under international treaties or due to judicial and extra-judicial decisions on disputes that are binding upon the Czech Republic). Included in particular are pension insurance benefits, government payments for health insurance, government social assistance, sickness insurance benefits, debt service expenditure, state contributions related to the support of building savings schemes and private pension schemes, allocations to state funds, expenditure on contributions to political parties, payments to the EU budget, unsuccessful arbitrations, etc.

In addition to the aforementioned mandatory expenditures, there are also so-called *quasi-mandatory expenditures*, which include, for example, wages of public sector employees, defence expenditures and international humanitarian assistance, investment incentives and

active employment policy. Such quasi-mandatory expenditures are not considered here, as it is within the government's powers to adjust them quite significantly through its own actions.

Macroeconomic interpretation of mandatory (and quasi-mandatory) expenditure is, however, not entirely trivial. In the short run, these expenditures limit the government's reactive ability to execute an active discretionary policy (in cases of unforeseen economic shocks). On the other hand, thanks to their inertia, they stabilise the business cycle to a certain extent. The key problem related to an increase in mandatory expenditures is that their expected growth is not compensated by any corresponding reductions in other expenditures and/or by increased taxation, which results in an increased fiscal imbalance.

2.1.3 Sustainability of public finance

The extrapolation of sustainability was taken from the publication "2009 Ageing Report: Economic and Budgetary Projection for the EU-27 Member States (2008–2060)" (European Commission, 2009b).

2.2 Wage elasticity and inflation persistence

2.2.1 Degree of adjustment of real wage growth to the unemployment rate (the Phillips curve)

A basic one-equation Phillips curve is used to estimate the elasticity of wages to the national unemployment rate (see, for example, Alogoskoufis and Smith, 1991, or Hycklak and Johnes, 1992, or Babetskii, 2006).

$$\Delta w_t = c_1 + c_2 u_t + c_3 \Delta p_{t-1} + \varepsilon_t$$

where $\Delta w_t = \ln(w_t) - \ln(w_{t-1})$, $\Delta p_{t-1} = \ln(p_{t-1}) - \ln(p_{t-2})$, w_t is the wage component of nominal unit labour costs, p_t is the HICP index, and u_t is the natural logarithm of the standardised unemployment rate. The coefficient c_2 represents the elasticity of wages to the unemployment rate, i.e. it characterises wage flexibility. Although the left-hand side of the equation contains nominal wage costs, the coefficient c_2 in fact assesses the flexibility of real wage costs if the coefficient c_3 is close to one. The rest of the variation in wage costs (e.g. as a result of changes in productivity, growth in import prices, etc.) is included in the constant c_1 . The source of the data (quarterly, seasonally adjusted time series) is Eurostat New Cronos. Since Eurostat has migrated to the new NACE2 classification, the wage cost data needed are only available from 2001. To assess its evolution over time, wage cost elasticity is now calculated for the period 2001 Q1–2009 Q1. Data for 1996–2001 are taken from the 2008 Alignment Analyses, where the same methodology was used for the calculation.

2.2.2 Degree of adjustment of regional real wages to the regional unemployment rate (the wage curve)

This analysis uses the methodology from the paper by Galuščák and München (2005). The authors estimate the wage curve using annual data on wages and unemployment for individual districts in the Czech Republic between 1993 and 2001. The wage curve equation can be written in the form:

$$w_{rt} = \alpha_r + \beta u_{rt} + \delta_t + \varepsilon_{rt}, \quad (1)$$

where w_{rt} is the logarithm of the nominal wage in region r at time t and u_{rt} is the logarithm of the regional unemployment rate. The regional (α_r) and time-specific (δ_t) fixed effects capture

differences in price levels across regions and price changes over time. The equation assumes that the differences across regions persist, whereas the time-specific fixed effects (annual dummy variables) measure aggregate shocks affecting all regions equally. The fixed effects also substitute for the adjustment of nominal wages for inflation. The coefficient β measures the elasticity of real wages.

The first difference of equation (1) removes the regional fixed effects:

$$w_{rt} - w_{r,t-1} = \beta(u_{rt} - u_{r,t-1}) + \delta_t'' + \varepsilon_{rt} - \varepsilon_{r,t-1}. \quad (2)$$

Equation (2) is estimated by the least squares method using instruments for the unemployment rate on the right-hand side of the equation. For example, the evolution of real wage elasticity can be seen from estimates for two-year periods between 1994 and 2008.

The wage curve is estimated on wage data for districts obtained by the workplace method and the business method; estimates of coefficient β are presented. Wages in districts were monitored for individual workplaces between 1993 and 2001. Since 2002, the CZSO has monitored wages by district using the business method only, aggregating the data for branches under the district of businesses' headquarters. For this reason, the estimates of the wage curve on wage data using the business method in 1993–2008 are less robust.

2.2.3 Sources of nominal and real wage rigidity (firm-level survey evidence)

The wage rigidity indicators are taken from the firm survey coordinated by the European Central Bank within the Wage Dynamics Network. Detailed information on the network's activities and the survey is available at www.ecb.int/home/html/researcher_wdn.en.html.

A harmonised questionnaire was prepared by economists from ESCB national central banks, ECB statisticians and ECB external consultants. The survey was conducted in 17 EU countries in the second half of 2007. The sample for each country covered firms with more than five employees in manufacturing, energy, construction, services, trade and financial intermediation.

The information on the degree of rigidity of nominal and real wages was taken directly from the firms' responses. The nominal wage freeze indicator is constructed as the proportion of firms that have frozen nominal wages in the past five years. The degree of application of indexation mechanisms is defined as the proportion of firms that reported an *automatic* relationship between nominal wages and past or expected inflation. Detailed information on measuring wage rigidity is given in Babecký et al. (2009).

Information on the responses of firms to the current financial and economic crisis was obtained from an additional survey of firms conducted in May and June 2009 and coordinated by the European Central Bank within the Wage Dynamics Network.

The sample comprised firms that had participated in the previous survey described in section 2.2.3, i.e. firms with 20 employees or more from all branches except energy generation and financial intermediation. A total of 236 firms, i.e. 60% of the original number, participated in the additional survey.

2.2.4 Inflation persistence

Inflation persistence is measured by three different methods. Quarterly data on HICP inflation (annual HICP changes) from 1997 Q1 to 2009 Q1 are used for the calculation. The source of the data is Eurostat.

Method 1

Method 1 uses the non-parametric technique proposed by Marques (2004) to estimate inflation persistence. This approach defines inflation persistence, γ , as $\gamma = 1 - n/T$, where n is the number of times actual inflation crosses the medium-term inflation value and T is the number of observations. Medium-term inflation is approximated using the Hodrick-Prescott (HP) filter. As the HP filter gives a biased trend estimate at the beginning and the end of the time series, the data for 1998 Q1 to 2008 Q4 were used for the actual calculation of inflation persistence.

Method 2

Inflation persistence is measured as the sum of autoregressive coefficients. For the purposes of the calculation, inflation is modelled as an autoregressive process and coefficients for the autoregressive terms are estimated. The modelled process used in Method 2 is described as

$$\pi_t = \mu + \sum_{i=1}^4 \alpha_i \pi_{t-i} + \varepsilon_t,$$

where π_t is inflation observed at time t . The sum of autoregression coefficients is defined as

$$\rho_K = \sum_{i=1}^4 \alpha_i$$

and estimated using the method proposed by Hansen (1999), which provides an unbiased estimate and asymptotically correct confidence intervals.

Method 3

Inflation persistence is again measured as the sum of autoregressive coefficients. The following model is considered:

$$\begin{aligned} \pi_{t+1}^T &= \pi_t^T + \eta_{1t} \\ \pi_{t+1}^P &= (1 - \delta)\pi_t^P + \delta\pi_{t+1}^T, 0 < \delta < 1, \\ \pi_t &= \left(1 - \sum_{i=1}^4 \varphi_i\right) \pi_t^P + \sum_{i=1}^4 \varphi_i L^i \pi_t + \varepsilon_{1t}, \sum_{i=1}^4 \varphi_i < 1, \end{aligned}$$

where π_t^T is medium-term inflation (or the central bank's implicit inflation target), π_t^P is the inflation target perceived by the public, η_{1t} and ε_{1t} represent independent white noises, L^i is

the lag operator and $\sum_{i=1}^4 \varphi_i$ is the sum of autoregressive coefficients. Inflation π_t is the observed variable and medium-term inflation π_t^T is approximated with the inflation time series smoothed using the HP filter. The Kalman filter and a Bayesian estimation are used to estimate the model parameters. The methodology draws on the article by Franta, Saxa and Šmídková (2007), where it is applied to data from a different source and period.

2.3 Labour market flexibility

2.3.1 Unemployment and internal labour market flexibility

Long-term unemployment is analysed by comparing the long-term unemployment rate (the share of those unemployed for 12 months or more under ILO methodology in the labour force) and the ratio of the long-term unemployed to total unemployment. The source of the data is Eurostat.

The **Beveridge curve** is an instrument frequently used to differentiate between cyclical and structural unemployment (Jackman, Pissarides and Savouri, 1990; Petrongolo and Pissarides, 2001; Galuščák and Munich, 2007). It expresses the dependence between vacancies and unemployment. Decreasing (increasing) unemployment amid a rising (falling) number of vacancies is associated with changes in the cyclical component of unemployment, whereas simultaneous movements of unemployment and vacancies in the same direction signal changes in structural unemployment. Simultaneous increases (decreases) in the number of vacancies and unemployment are linked with increases (decreases) in structural unemployment. Data on unemployment and vacancies are from the Ministry of Labour and Social Affairs (MLSA).

Aggregate fixed effects of the matching function are an indicator of the degree of mismatch in filling vacancies. The matching function was estimated in the form:

$$\log o_{it} = \beta_1 \log U_{i,t-1} + \beta_2 \log V_{i,t-1} + \gamma_1 \log u_{it} + \gamma_2 \log v_{it} + \alpha_i + \varepsilon_{it}$$

where o_{it} is the number of persons leaving the labour office register in district i in period t , $U_{i,t-1}$ and $V_{i,t-1}$ are the numbers of unemployed persons and vacancies, u_{it} is the number of newly registered job seekers, v_{it} is the number of newly reported vacancies and α_i are regional fixed effects. The equation is estimated in first-order differences using instruments for $U_{i,t-1}$ and $V_{i,t-1}$ (Galuščák and München, 2007). The two estimation methods differ in the set of instruments used. Aggregate fixed effects are obtained by aggregation weighted by district size.

Regional differences in unemployment are measured by the coefficient of variation. The coefficient of variation in the regional unemployment rate is the ratio of the standard deviation weighted by the district size to the average unemployment rate. The size of the coefficient of variation depends on the degree of disaggregation. Data for similar region sizes (e.g. NUTS 2 or NUTS 3) and the evolution of the coefficient of variation over time can be used for comparison. The source of the data is Eurostat.

The skills and regional mismatch between labour demand and labour supply is expressed by the number of unemployed persons per vacancy in regions and by profession. Data on the number of unemployed people and vacancies are from the MLSA.

The CZSO publishes the volume of **internal migration** (movement between municipalities). Data on registered internal migration in other countries are published in statistical yearbooks. Since 2001, migration of foreigners with long-term residence (over 1 year) has been included in the statistics, whereas before 2001 only migration of Czech citizens and foreigners with permanent residence permits was monitored. Consequently, the pre-2001 data are not comparable with the more recent data. Another reason for this non-comparability is that the data for 2001 onwards include the results of the 2001 Census.

2.3.2 Structural unemployment

The NAIRU analysis presented in the main part of the text focuses on the medium-term NAIRU concept,¹⁷⁶ which defines the NAIRU as the equilibrium rate towards which unemployment converges in the absence of temporary supply shocks once the dynamic adjustment of inflation to previous shocks is completed. A semi-structural approach using the *Kalman filter* is applied (Richardson et al., 2000; Szeto and Guy 2004).

The estimate of the NAIRU as an unobserved variable is based on the assumption that stable inflation (i.e. inflation equal to inflation expectations) means, *ceteris paribus*, a rate of unemployment equal to the NAIRU. However, rising (falling) inflation indicates a shift in the unemployment rate below (above) the NAIRU. The basic model equation captures relationship determined by the Phillips curve, modelling inflation as a function of lagged inflation, the deviation of unemployment from the NAIRU and two variables helping to explain short-term supply shocks. The next equation specifies the process generating the NAIRU time series, which is assumed to follow a random walk process. Inflation expectations are not modelled endogenously. Lagged inflation was used to proxy for inflation expectations. Short-term supply shocks are captured using import prices and oil price developments. These two variables help explain short-term movements in inflation, which allows us to estimate the NAIRU compatible with non-rising inflation in the absence of such temporary supply shocks. The unemployment gap, i.e. the difference between the unemployment rate and the NAIRU, can be regarded as representing demand pressures in the equation.

$$\begin{aligned}(\pi_t - \pi_t^e) &= \alpha(L)(\pi_{t-1} - \pi_{t-1}^e) + \beta(L)(u_t - u_t^*) + \gamma(L)\Delta x_t + \varepsilon_t, & \varepsilon_t &\sim N(0, \sigma_\varepsilon^2), \\ u_t^* &= u_{t-1}^* + v_t, & v_t &\sim N(0, \sigma_v^2).\end{aligned}$$

In these equations π_t is inflation, π_t^e is expected inflation, u_t^* is the NAIRU, $(u_t - u_t^*)$ is the unemployment gap, x_t represents short-term supply shocks and L is the lag operator.

Determining the volatility of the NAIRU is an important part of the estimation. The smoothness of the estimated NAIRU series is determined by the variances of the residuals in the two equations above (Phillips curve, random walk) and the relationship between those two variances. The larger is the ratio of the NAIRU variance to the inflation variance, the more volatile is the estimated NAIRU series, i.e. the unemployment gap explains almost the entire variance in inflation. By contrast, a low ratio of the variances means that the estimated NAIRU changes very little over time. The ratio of the estimated standard deviations is roughly 1:5.

2.3.3 International labour mobility

International migration and proportion of foreigners in the population. The source of the data on registered international mobility for individual countries (immigration and emigration) is Eurostat, and the data on registered foreign employment in the Czech Republic are obtained from the MLSA.

¹⁷⁶ The OECD distinguishes three different NAIRU concepts according to their time frame. Short-term and long-term NAIRU concepts exist in addition to the medium-term NAIRU. The short-term NAIRU is the rate of unemployment consistent with stabilising the inflation rate at its current level in the next period. The long-term NAIRU is that equilibrium rate of unemployment corresponding to a long-term steady state, once the NAIRU has fully adjusted to long-term and short-term supply shocks and economic policy influences.

2.3.4 Institutional environment

2.3.4.1 Trade unions and collective bargaining

The relevant indicators in the area of institutional arrangements for collective bargaining include the degree of coverage by collective agreements. The data are taken from a harmonised ECB survey. The national part of the questionnaire was prepared by the CNB through its branches in 2007. The sample in the Czech Republic comprised 399 corporations. Weighted data were used for manufacturing, construction, trade and market services, excluding financial intermediation, in corporations with 20 employees or more.

2.3.4.2 Minimum wage

The relationship of the minimum wage to the average wage and to the wage in the first decile of the wage distribution. The data used are from Eurostat and the Average Earnings Information System (MLSA).

2.3.4.3 Employment protection

The **Employment Protection Legislation (EPL) Index** is taken from OECD and relates to 2003, 2006 and 2008. It consists of 18 items assessed in accordance with the Labour Code in force. These items are aggregated for the areas of permanent employment, temporary employment and collective dismissals.

Costs of individual termination of an open-ended contract in the number of days for which the wage has been paid since notice was given by the employer – includes the number of days of notice, severance pay and the delay to start of notice.

2.3.4.4 Labour taxation

Overall labour taxation (the tax wedge) is defined as social security contributions paid by employees and employers and income taxes relative to overall labour costs. This indicator is calculated in line with the applicable tax legislation for model types of households. The data are from OECD (2009).

The average effective tax burden is described by **implicit tax rates**, which are calculated as ratios, with the numerator containing the sum of aggregate revenue from direct taxes (in some countries also indirect taxes paid by the employer) and social contributions paid by both employees and employers, while the denominator comprises total compensation of employees (data under ESA95 methodology). The disadvantage of this indicator is that it is dependent on the business cycle. Inflation and real income growth increase the tax component of implicit tax rates where the income tax is progressive. Social contributions, which are usually degressive with rising income, can have the opposite effect. The overall effect of the cycle on implicit rates depends on which of the two factors is dominant. The data on implicit tax rates are taken from Eurostat (2009).

2.3.4.5 Work-incentive indicators

The data on the **net replacement rates (NRRs)** are taken from OECD tax benefit models for individual types of households, persons in the initial phase of unemployment who are entitled to unemployment benefits and persons not entitled to unemployment benefits (inactive or long-term unemployed). More detailed data and the distribution of NRRs for the Czech Republic are calculated using a micro-simulation tax and benefit model (Galuščák and Pavel, 2007). The calculations have been updated using the parameters valid in 2008.

Net replacement rates measure the extent to which the combination of taxes and benefits affects the financial gain from work and thereby the motivation of unemployed or inactive persons to enter employment. The NRR is defined as the ratio of net household income when the person under consideration is jobless to that when the same person has a job. Gross incomes of the other members of the household are supposed to be identical in both cases. NRRs only identify financial entitlements to social benefits. Provided that there is sufficient monitoring of the job-seeking activity of the unemployed, even high NRRs may be associated with sufficient job-seeking incentives.

2.4 Product market flexibility

2.4.1 Administrative barriers to entrepreneurship

Administrative barriers to entrepreneurship. The index of barriers to entrepreneurship is taken from the OECD Product Market Regulation Database, where it is a part of a broader OECD indicator assessing the degree of regulation on product markets. The index consists of individual items aggregated in three areas: Administrative burdens on start-ups (Administrative burdens for corporations, Administrative burdens for sole proprietors, and Sector-specific administrative burdens), Regulatory and administrative opacity (Licences and permits system, and Government communication and simplification of rules and procedures) and Barriers to competition (Legal barriers to entry into the industry – limitations on the number of entities, Antitrust exemptions for public enterprises, Barriers in network sectors, and Barriers in services).

The rankings of countries in the area of starting or closing a business are taken from the World Bank's Doing Business database (World Bank, 2008). As regards starting a business, number of procedures, time (days), cost and minimum capital requirements in % of income per capita are taken into account. The area of closing a business includes data on time in years, cost in % of total assets and recovery rate in cents on the dollar. The rankings include all countries in the database and have been recalculated for 2007 by comparison with World Bank (2007) to account for changes in methodology and country selection. The rankings for previous years are not available; only partial data are published, from which the country rankings were derived.

2.4.2 Tax burden on businesses

The highest **statutory tax rates** are taken from Eurostat. **Implicit tax rates on corporate income**, defined as the ratio of total tax revenues to the potential tax base (national accounts data under ESA95 methodology), are an additional indicator. The potential tax base is approximated using national accounts output and income statistics. In contrast to statutory rates, implicit tax rates take into account depreciation, amortisation and tax exemptions, hence they express the actual average effective tax burden on corporate income. Their disadvantage is that they depend on the business cycle. For example, a decrease in the statutory tax rate does not affect the implicit rates if it is offset by a broadening of the tax base. The data are taken from Eurostat.

2.4.3 Costs associated with exit from the sector

Data on the number of insolvencies are from Creditreform statistics. The data are monthly and quarterly. The international comparison was performed differently from the rest of the document owing to a lack of data.

2.5 Flexibility and shock-absorbing capacity of the banking sector

Indicators reflecting the size of credit risk and the extent of control over credit risk through the creation of reserves and provisions and indicators showing business success in the banking sector were selected to assess the stability and shock-absorbing capacity of the banking sector.

Non-performing loans (NPLs)/total loans (%)

NPLs (in gross book value) in the banking sector (“loans in default” in Czech accounting terminology) as a percentage of total loans in gross book value express how large or how concentrated is the credit risk faced by the country’s banking sector. NPLs are loans that are classed as substandard, doubtful or loss loans.

Capital adequacy (%)

Capital adequacy is an aggregate indicator reflecting all activities of a bank (both balance sheet and off-balance sheet) as well as the potential losses (reducing profit) which a bank may incur from the risks it undertakes and the depreciation of assets through the creation of provisions and reserves. A bank’s capital adequacy should exceed the solvency threshold of 8% under the relevant CNB Decree and CNB Provision.

Capital adequacy expressed as the ratio of a bank’s capital to the corresponding coverage of potential losses from risks it undertakes assesses the outlook for the bank’s financial situation. Capital adequacy indicates its ability to cover potential future losses with capital. A bank is sufficiently solvent if best practices have been applied in risk assessment and all potential future losses connected with present risks will be or should be covered by shareholders’ equity.

In addition to this prudential function, capital is used to develop future business activities. The higher the capital adequacy, the better the bank is protected against risks, but the less it is using its potential earnings per unit of capital. By developing the bank’s business, shareholders – represented by management – increase the profit while retaining capital coverage of risks, i.e. within the limits of appropriate use of capital.

After-tax profit/assets (RoA, %)

This indicator can be viewed as a synthetic measure of the profitability of the banking business, aggregating the results of the extent and diversification of banks’ activities and the business risks undertaken. Under less stable conditions, the profitability indicator is more volatile; the negative values of this indicator in some countries reflect losses caused mostly by a failure of the business risk management system, inefficiency and other factors.

Net interest margin (NIM, %)

$NIM = (\text{interest income} - \text{interest costs}) / \text{interest bearing assets}$. The indicator shows the rate of profitability and business success in banking. If rates on the interbank market fall, the margin on loans and deposits usually also decreases. This is a sensitive and less available indicator.

Net non-interest income/average assets (%)

The ratio of net non-interest income (from fees and commissions and other financial operations) to average assets. Banks' net non-interest income does not include other operating revenues and costs. Banks generally show a tendency towards rising non-interest income if the margin on interest-bearing bank operations declines, primarily through rising fees and commissions. The conduct of competitors is a significant corrective factor.

It is difficult to determine from the available data on net non-interest income whether other operating costs and revenues were included in addition to fees and commissions and other net income on financial operations. For technical reasons, the indicators for the EU and the euro area are usually calculated relative to assets at the year-end rather than to average assets. The ratio to average assets provides a clearer picture of the distribution of costs and revenues per unit.

Stress test scenarios

To assess the resilience of the Czech banking sector, stress tests are performed which subject bank portfolios to predicted changes in key macroeconomic variables. The proposed scenarios consist of combinations of (usually unfavourable) developments in macroeconomic factors – GDP growth, inflation, interest rates and the exchange rate – and their impacts on loan quality and market risk in banks' exposures. A credit model was used to estimate credit growth and the development of default rates in banks' portfolios, taking into account the expected evolution of macroeconomic variables.

The current stress test methodology used by the CNB and other national and international institutions to test the resilience of the financial sector is limited as regards its ability to capture the effects of individual shocks over time and their potential feedback effect on the macroeconomic environment. However, the current version of the tests used at the CNB enables us to identify the different contributions of individual shocks over time, as the tests use a long (two-year) horizon and model the effects of the individual shocks at quarterly frequency.

The effects of combinations of credit, interest rate, currency and interbank contagion shocks are assessed by comparing the capital adequacy ratio before and after the shocks affect banks' portfolios. The calculations assume that even in an adverse scenario banks would generate income, especially net interest profit and profit from fees. Profits in the stress situation are lower than usual. In the case of insufficient profits, the impacts of the shock are subtracted directly from capital.

The scenarios are based on potential situations on the financial markets and in the economy, with an emphasis on adverse evolution of the business cycle. The scenarios cover realistic versions of events (the baseline) as well as potential extreme situations close to historical shocks in the Czech economy. In addition to a larger drop in real GDP, an increase in non-performing loans and a decline in prices of securities, especially bonds, are assumed. The model situations will not necessarily repeat – the scenarios are of a cautionary nature and will not necessarily materialise. These seriously unfavourable scenarios, with strong impacts on the banking sector, are constructed to estimate extreme potential losses and the necessary level of capitalisation of banks, or to identify the costs of banks' responses to asymmetric shocks from the financial markets to safeguard the functioning and stability of the system.

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